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TELEPHONE ENGINEER

MANAGEMENT • ENGINEERING • MAINTENANCE

JULY
1937

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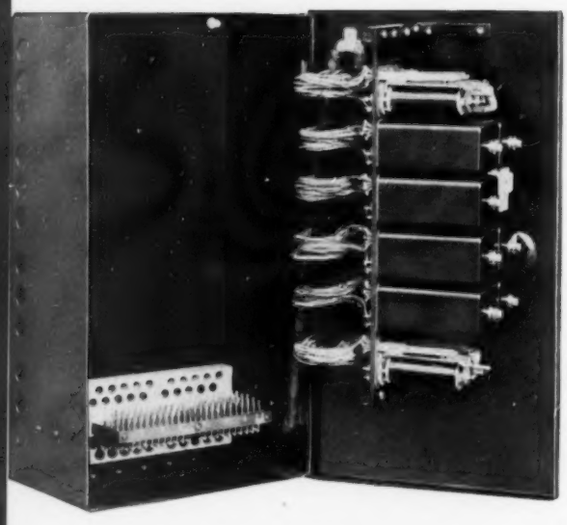
THESE PIONEERS . . . WHO ARE THEY?

IDEAL TELEPHONE SERVICE FOR THE SMALL INSTITUTION



Interior view of sheet steel cabinet arranged for wall mounting in basement or closet and containing all relays, fuses and terminals. This is a regular part of the equipment of the Stromberg-Carlson 2-6 Telephone System.

The institution, office or factory too small for a PBX Switchboard finds the Stromberg-Carlson 2-6 Telephone System an ideal solution to the problem. It is a simplified common talking, selective ringing telephone system with two trunks and six lines, providing both central office and local communication service from the same instrument without the services of an operator.

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Economical to operate, the Stromberg-Carlson 2-6 Telephone System requires a central office battery of 22 volts or 18 local dry batteries of 1½ volts each.

Stromberg-Carlson will gladly send you informative Bulletin outlining how the Stromberg-Carlson 2-6 Telephone System will assist you in selling additional services to smaller institutions or offices.

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Published Monthly by **Telephone Engineer Publishing Company.**
A magazine devoted to the interests of the entire telephone industry —operating men and manufacturers.

TELEPHONE ENGINEER

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Palaver

Being in vogue has its pitfalls—we found it out during the past few weeks. Unless you have a little strike in your daily life we now understand you have not really lived. When the laundress "sat down" coping was elementary — (though unsuccessful as we needed the shirt) but when our printers placed us as the innocent third party in his strike we found our limited coping experience was literally "Neddy in the First Reader"—all anent and why our June issue reached you two weeks late. Need we go on?

▼

With that off our chest—may we introduce C. F. Peterson, the author of the new series starting in this issue. New to TELEPHONE ENGINEER readers, but well versed in his subject, we predict the same enthusiastic reception you accorded the series on Showmanship by Kaufman and on Test Desk Operation by Curtiss. We invite your comments, be they brickbats or bouquets.

▼

Orchids are much cheaper presented on paper—but last longer! We have a duty that always leaves us with a glow—presenting orchids from the heart instead of from the florist. They are for the association executives who read the recent Carmody REA release No. 203 and immediately hauled out their "sewing machines" to stitch what these eyes believe to be the cleverest groupings of words and phrases in support of their members, we have ever read. Our opinions on the same subject are on the editorial page in this issue.

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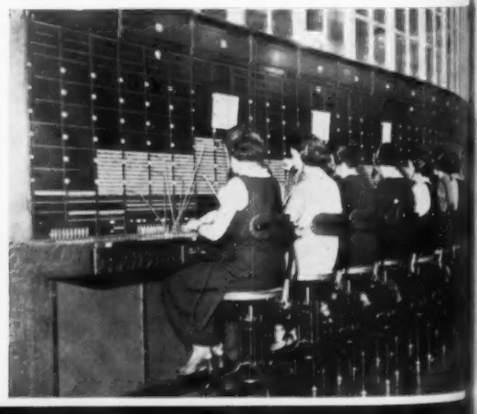

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Editorial « « «

Emergence from the first and second stages, the furor caused by the now famous release No. 203 issued by REA Administrator John M. Carmody on June 9th, is now at its third stage. The first was caused by the very audacity of the press release and its flat footed "about face" for the REA in respect to inductive interference caused by multi-grounded requirements on all their projects. The second stage saw protests of the various telephone associations, endeavoring to protect the small rural, mutual and farmer owned lines that face elimination under this attitude, by letters and later by a delegation to Washington led by the U. S. Independent Telephone Association. Our report on this conference is carried on page 15 of this issue.

Between the lines one might feel that REA is more interested in spending the huge appropriation on new projects, neglecting the basic idea on which its paternity was founded; lower utility rates for the masses. Association executives are congratulated on their immediate action in informing the 14,000 smaller companies of this autocratic action of a potential government bureaucracy. The smaller company's very existence is threatened, when they are faced with the financial outlay new metallic lines will mean when inductive interference by REA projects renders their existing lines unusable.

REA Chief Engineer O. M. Swanson wrote Oscar Burton, President of the Texas Telephone Association and a director of the United States Independent Telephone Association a letter which we are reproducing in part below. Substituting the words in parenthesis for those in italic the letter would suffice for the telephone industry to its entire satisfaction:

> "With the use of *multi-grounded* (grounded) *distribution* (telephone) system, we as *engineers* (operators) believe that we are offering to the *consumers* (user) of *electricity* (telephones) an opportunity to get service at lesser cost and at the same time a more easily maintained distribution that will not require the highly skilled and expensive personnel that is normally found in many *electric distribution* (telephone service) organizations."

May we suggest to Administrator Carmody that a return to a cooperative basis, such as that enjoyed by his predecessor, will definitely preclude his "losing face" with his political affiliations and the telephone industry as a whole.

TELEPHONE ENGINEER
MANAGEMENT • ENGINEERING • MAINTENANCE

JULY, 1937

"Tapping In" On Washington

By ROLAND C. DAVIES
Editor
Telecommunications Reports

● Progress in the ironing out of the controversy raised by the Rural Electrification Administration in connection with the reimbursement of Independent telephone companies for inductive interference by rural electric power projects, was attained after the recent all-day conference between leading spokesmen of the U. S. Independent Telephone Association and REA officials in Washington, but further negotiations seemed to be slated before a satisfactory settlement could be reached. The results of the conference, however, were considered as satisfactory for the Independent industry. Louis Pitcher, executive vice-president, and Charles C. Deering, secretary-treasurer of the U. S. Independent Telephone Association, presented the problem of the smaller Independent telephone companies, particularly the 36,000 farmer mutual and cooperative companies, to a group of REA officials and explained that a great deal of the telephone plant of the smaller Independents in sparsely settled regions comprised single return grounded lines. They emphasized, however, that these lines afforded satisfactory service in rural sections and that the inductive interference by REA power projects would seriously disrupt the highly valuable telephone service to farmers and rural residents.

● Citing that former REA Administrator Morris L. Cooke had agreed two years ago for adequate compensaion to small Independents which were damaged by power lines' interference, Mr. Deering declared that the new policy of the REA to oppose satisfactory compensation to the telephone companies, as enunciated in the recent press statement of REA Administrator Carmody, was a complete reversal of the previous policy. Mr. Deering cited that there might be, in many rural sections, considerably more telephone subscribers than participants in the REA power projects, so the power cooperatives should rightfully bear the cost of any damage to the telephone service. Both Independent Telephone Association officials cited that the metallicizing of rural telephone lines by the small companies would impose a huge financial burden on them and would lead to the absolute necessity for increased rates which in turn would be a hardship on the farmers—the same class that the REA is trying to help.

● The fact that the major damage from the inductive interference of the REA power projecets would fall upon the smaller Independents, in most cases owned and operated by the farmers themselves, seemed to make the greatest impression upon the REA officials, who were Kendall Foss, in charge of the administration's information service; H. L. Lamberton, in charge of the opinion section; Engineer Crimm and Miss Helen Moss, an attorney. Mr. Foss appeared to agree that the nub of the situation was to provide for the proper allocation of the costs of any damage to the telephone lines. However, Mr. Lamberton and Engineer Crimm seemed to take a position that the REA was within its rights to reject damage claims of Telephone Independents.

Five officials of state independent telephone associations presented to the REA representatives the positions of their respective state commissions and the regulations which those state bodies had established. They were President Walter J. Gallon of the Wisconsin association; H. B. Couch, secretary of the Kansas association; J. C. Crowley Jr., Minnesota association secretary; R. W. Hedrick, secretary of the Missouri association, and James M. Cox, Tennessee association president. Mr. Cox explained the successful negotiations between the Independents in his state and the Tennessee Valley Authority for compensation which recorded a substantial effect with the REA spokesmen. Other leading Independent officials who participated in the conference were A. L. Geiger, general attorney of the national association, and B. L. Fisher, president of the Lee Telephone Co. of Martinsville, Va., and former president of the Virginia association.

● REA Engineer Crimm pointed out that the telephone lines ought to be me-

tallic as grounded lines were obsolete. He emphasized that the subscribers ought to pay higher rates. But Mr. Cox and other Independent representatives cited that it would be difficult to persuade the rural subscribers to pay higher rates and that the trend of FCC and state regulation was towards steady reducing of rates, so the REA policy would be contrary to the present public trend. Mr. Lamberton suggested that the small telephone companies could obtain compensation for lines damaged by REA projects from another "government pocketbook" like the Farm Credit Administratin.

The 1919 Wisconsin Tenney case was emphasized by REA lawyer Lamberton as upholding the REA stand, but Mr. Geiger pointed out that the decision of the court held grounded lines were satisfactory in rural sections but not in cities or towns. Mr. Geiger also noted that the present rules of the Wisconsin commission, adopted in 1936, would be the prevailing regulations. The Commonwealth Telephone Co. of Wisconsin, which was one of the Independents noted without identification in the Carmody statement, was not discussed at all at the conference.

● The Independent Association representatives were asked to submit further statements of facts and legal briefs to the REA before the latter would reach a final decision.

A. T. & T. Asks For Investigation "Square Deal" . . .

● The FCC Telephone Investigation hearings which had been conducted intermittently for nearly 16 months came to an end on the last day of June with a renewed and strong protest by the counsel for the American Telephone and Telegraph Co. that the ex-parte character and procedure of the inquiry through the ban against cross-examination and rebuttal testimony had not given the Bell System "a square deal" and that the record was so replete with mis-statements and unfair and unwarranted criticisms of the telephone industry as to leave the Commission without a sound basis for its future regulatory activities and its legislative recommendations to Congress.

The next step in the investigation will be the preparation of a voluminous report to Congress, containing recommendations for increased legislative powers to strengthen the FCC's regulatory powers over the telephone industry, particularly over the functions of the American Telephone and Telegraph Co., and its non-carrier subsidiaries, the Western Electric Co. and Bell Telephone Laboratories, Inc. However, no reports will be drafted in final form by the Investigation staff, which will comprise 10 or 13 members of the force which has been delving into the various phases of the industry during the past two years, until next fall. The Commission itself will review the report to Congress as it is drafted by the Investigation staff and it is considered very likely that many changes will be evolved before the report goes up to Capitol Hill. The report, as planned at present, will not be transmitted until the first month or so of the next session of Congress which convenes in January, 1938.

● Under a ruling on the final day of the investigation hearings by FCC Telephone Division Chairman Paul A. Walker, the American Telephone and Telegraph Co., the Bell System Companies and the Independent Telephone industry will have the opportunity of filing corrections of facts and figures and statistics which have appeared in the scores of Investigation staff reports placed in the record as exhibits up to September 30, 1937. The reports dealing with various phases of the telephone industry, mainly about the A. T. & T. and Bell System, total more than 14,000 pages, while the direct testimony of Investigation witnesses totaled over 7,000 pages. In addition, there were additional exhibits consisting of supporting data — letters, reports, memoranda, etc.—which numbered more than 20,000 pages. This constituted the harvest of the FCC Investigation for which Congress in two sessions, commencing with the early winter of 1935, appropriated a total of $1,500,000, while it is estimated that the cost to the A. T. & T. and Bell System was more than double that figure.

However, the FCC Investigation staff, headed by Counsel in charge Holmes A. Baldridge and Chief Engineer Cyrus G. Hill, felt that the testimony and reports of the final two weeks of the Investigation hearing constituted a high spot of the inquiry which would form the principal points of the Commission's reports to Congress. Several major reports, of the Investigation engineering staff which in a nutshell charged the Bell System had excessive depreciation reserves and the Western Electric Company with having too high costs of manufacturing

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CONVENTION SCHEDULE

Michigan Independent Telephone Association, Olds Hotel, Lansing, July 28 and 29.

The Illinois Telephone Association, Hotel Pere Marquette, Peoria, September 22 and 23.

Independent Pioneer Telephone Association, Hotel Stevens, Chicago, October 14.

United States Independent Telephone Association, Hotel Stevens, Chicago, October 12, 13, 14, and 15.

ANOTHER FRANKENSTEIN?

Location of Cable Faults

by
C. F. PETERSON

The following article deals with the location of faults in cable plant. It contains an excellent treatment of the most popular Wheatstone Bridge method and deals with the subject in a manner that should make this subject very understandable to those called on to locate cable faults.

PART I

General ● The location of faults in aerial or underground cable is generally accomplished by one of three methods. These methods are:

1. By visually observing the cable sheath for openings capable of admitting moisture and causing trouble. (Useful only for certain types of trouble in aerial cable.)
2. By the application of a "tone" to the pair that is in trouble and the use of an exploring coil which is held against the sheath and which indicates by the presence or absence of tone induced in it on which side of the fault the tester is located.
3. By the use of a Wheatstone Bridge which enables fault locations to be made by precise electrical measurements.

The fault location method to use in any specific case of cable trouble will depend largely on the circumstances surrounding the trouble. On cable plant which is in particularly bad shape due to improper or deferred maintenance and where several sheath openings may be present, a visual inspeciation is often the quickest and most satisfactory method of running down moisture faults.

The precision with which faults can be located using the Wheatstone Bridge (where only a single fault exists) warrants that it be used on all cases of cable trouble on cable plant which is in reasonably good condition.

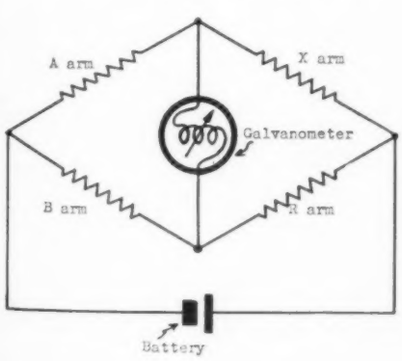

Figure 1

The exploring coil method of locating cable faults is most useful in locating the exact point at which the fault occurs, after a bridge location has shown its approximate location. It is particularly useful on cable faults in which the sheath is not damaged, hence there is no external evidence at the point at which the fault is located. A bridge location will generally enable the tester to go directly to a point within a few feet of the fault and if the fault is due to a sheath opening, it can generally be quickly located without the use of the "tone" method.

Initial Procedure in Handling Cable Trouble ● When cable trouble is indicated by "lamp permanents," cross ringing, crossstalk, etc., the first step is to check the insulation resistance of various pairs in the affected cable in an effort to localize or trace the trouble to a specific cable. This is accomplished by observing the rack numbers of the affected cable pairs and then noting in what cycle these pair appear. To illustrate—if it is observed that cable pairs 1, 4, 10, and 24 are all in trouble and these pairs are all found in a 25 pair cycle, then it is likely that a 25 pair cable carrying 1-25 count is the one affected. If on the other hand the pairs 4, 29, 43, 72, and 89 were affected and all these pairs are found in a 100 pair cycle then the trouble probably lies in a 100 pair cable.

By thus examining the rack numbers of the affected cable pair we can readily localize our trouble to some specific cable. This procedure is of course useful only where several pairs are affected which is generally the case with moisture trouble or mechanical damage.

Use of Wheatstone Bridge After the preceding procedure has been followed in order to localize the trouble, then a bridge location test should be made. This test, which is later described in detail should give an approximate location of the fault.

● A cable repairman should be immediately dispatched to the location of the fault determined by the bridge test. He should be instructed to examine the cable sheath several spans each side of the theoretical location in an effort to locate the sheath break. In the event the sheath break (moisture trouble) cannot be found, the "tone" should be applied to one of the pairs in trouble and the repairman should apply the exploring coil to the sheath to determine in which direction the fault lies. Usually, if the fault is of sufficiently low resistance, the exploring coil will lead directly to it.

In the majority of faults of the moisture or mechanical damage type, repairmen will be able to quickly locate the sheath break by visual inspection of the cable if proper care is taken in using the bridge, as *it should show within a few feet of the actual fault.*

● Deviations in actual fault location from the theoretical locations computed by

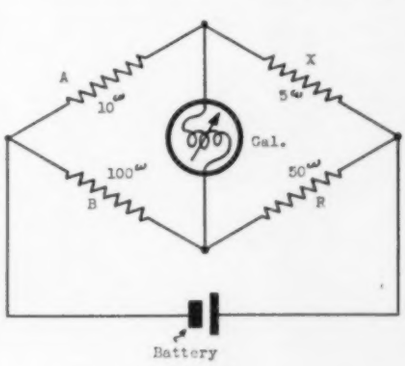

Figure 2

bridge measurements result from several factors, viz:

1. Failure to take into account cable sag when making ground measurements.
2. Failure to make temperature corrections in resistance readings.
3. Difference in resistance between the various pairs in a cable (particularly large cables) due to the fact that some of the pairs are in the outside layers, hence larger than pairs in the core.
4. The presence of two or more faults on the bad wire under test.

In dealing with moisture faults in aerial cable, a bridge location may be considered good if within one or two spans of the actual trouble point. In underground work where extreme accuracy is necessary, great care should be taken in making bridge measurements and applying the proper corrective factors. The "short" connecting the good and bad wires should be placed as close as possible to the section of cable in which the fault is thought to exist.

Principle of the Wheatstone Bridge The principle of the Wheatstone Bridge is very simple and should be understood by those who expect to use the bridge in locating cable faults. The bridge itself consists essentially of three variable resistances, generally referred to as "resistance arms," a sensitive galvanometer, a source of testing current, and two terminals to which can be connected the resistance to be measured.

● Figure 1 shows schematically the circuit of the fundamental Wheatstone Bridge.

The operation of the Wheatstone Bridge as a resistance measuring device is based on the fact that the value of an unknown resistance connected in the X arm of the bridge (this is the unknown arm) can be determined by the value of the resistances cut into the other three arms of the bridge (known as the A, B, and R arms) provided the resistance of the three variable arms is so adjusted that a sensitive galvanometer connected across the junction of the resistance arms gives zero deflection.

This balanced condition of a Wheatstone Bridge exists, when the resistanec of the several arms are in the following proportion:

$$A : B : : X : R$$

That is, when the resistance of the A arm is to the resistance of the B arm as the resistance of the X arm is to the resistance of the R arm.

● To illustrate (see figure No. 2) if we have 10 ohms cut into the A arm, and

Figure 3

100 ohms into the B arm, and if we adjust the R arm until the galvanometer gives zero deflection, which condition we find occurs when the R arm is set on 50 ohms. We then know that the resistance cut into the B arm must have a value of 5 ohms. Substituting these values into our basic equation we find that—

$$A : B : : X : R \qquad 10 : 100 : : 5 : 50$$

We can see that this is a true equation inasmuch as the product of the two middle terms of the equation equal the product of the two outside terms.

Practical Features of the Wheatstone Bridge In the practical use of the Wheatstone Bridge, the mathematical computations involved are very simple. Most modern bridges are equipped with a "ratio dial" rather than separate adjustable A and B resistance arms. The ratio dial merely changes the ratio of the resistance between the A and B arms. It is calibrated in terms of the ratio of the resistance in arm A to the resistance in arm B. The readings on this dial are 1000, 100, 10, and 1 and 0.1, .01 and .001. A typical Wheatstone Bridge is shown in figure 3.

As an illustration of the qualitative significance of these ratios assume the ratio dial is set on 100. This would mean that the resistance cut into the A arm of the bridge was 100 times the value of the resistance cut into the B arm. If the ratio dial was set on .001 this would mean that the resistance cut into the A arm is only one-thousandth the value of the resistance in the B arm.

● On Wheatstone Bridges equipped with separate adjustable A and B arms, the simple equation shown below is used in solving the value of the unknown resistance connected to the X arm.

Where—

$$X = \frac{AR}{B}$$

X=Resistance in ohms of unknown resistance connected to X arm of bridge.

A=Resistance cut into the A arm.

B=Resistance connected in the B arm.

In other words, we merely multiply the ohmic setting of the A arm by the resistance cut into the R arm, and then divide by the resistance cut into the B arm.

To illustrate, (see fig. 2) if the settings of the several arms are as follows: A=10, B=100, R=50, then the resistance connected in the X arm would be:

$$X = \frac{AR}{B} = \frac{10 \times 50}{100} = 5 \text{ ohms.}$$

If our bridge is equipped with a ratio dial the formula would be:

Where—

$X = MR$

M=Ratio dial setting.

R=Rheostat setting.

● In the above example the ratio dial setting would have been 0.1, hence the problem would have been solved as follows:

$$X = M \quad R = 0.1 \times 50 = 5 \text{ ohms.}$$

Specific Uses of the Wheatstone Bridge in Telephone Work The Wheatstone Bridge has two specific uses in telephone work, viz:

1. For straight resistance measurements of cable or open wire pairs.
2. For so-called "loop" measurements for precise fault location work.

The bridge is also used for locating opens. However, this use will be discussed later in this article.

For use in making straight resistance measurements, the circuit or apparatus to be measured is connected to the X_1 and X^2 terminals of the bridge and the bridge adjusted until the galvanometer shows zero deflection. The unknown resistance

(Please turn to page 34)

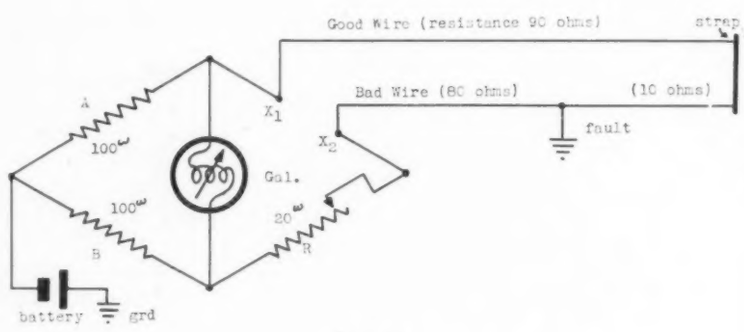

Figure 4

The Bronze and Blue Badge of Honor

Independent Pioneer Telephone Association

By LOREN M. BERRY

Mr. Berry, the president of the Pioneers points out the advantages of membership in this distinguished group of Independents and gives some information as to the traditions and ideals of the Pioneers. He believes every Independent telephone man or woman with ten years service should belong to this association.

● On this fifteenth anniversary of the Independent Pioneer Telephone Association, we of its official family make an earnest appeal to every Independent Telephone man or woman, who has seen ten years of service, to join us in perpetuating the ideals and traditions of our industry.

The Pioneers is not an exclusive club for the few who have won their way to wealth and affluence. It is a telephone institution founded upon sentiment and mutual regard, within which the presidents and executives of operating and manufacturing companies—large or small—rub shoulders and exchange reminiscences with veteran line men, wire chiefs, operators, and other workers.

To my mind, a certificate of membership in the Independent Telephone Pioneers is one of the finest character witnesses that any man or woman could possess, for it testifies to prolonged service in an essential industry and to human values that are of the highest and finest qualities. Any of you who have the necessary ten years of telephone service and are not now Independent Pioneers will be welcomed to such membership, not only by myself, as president, but by the officers, directors, and entire membership.

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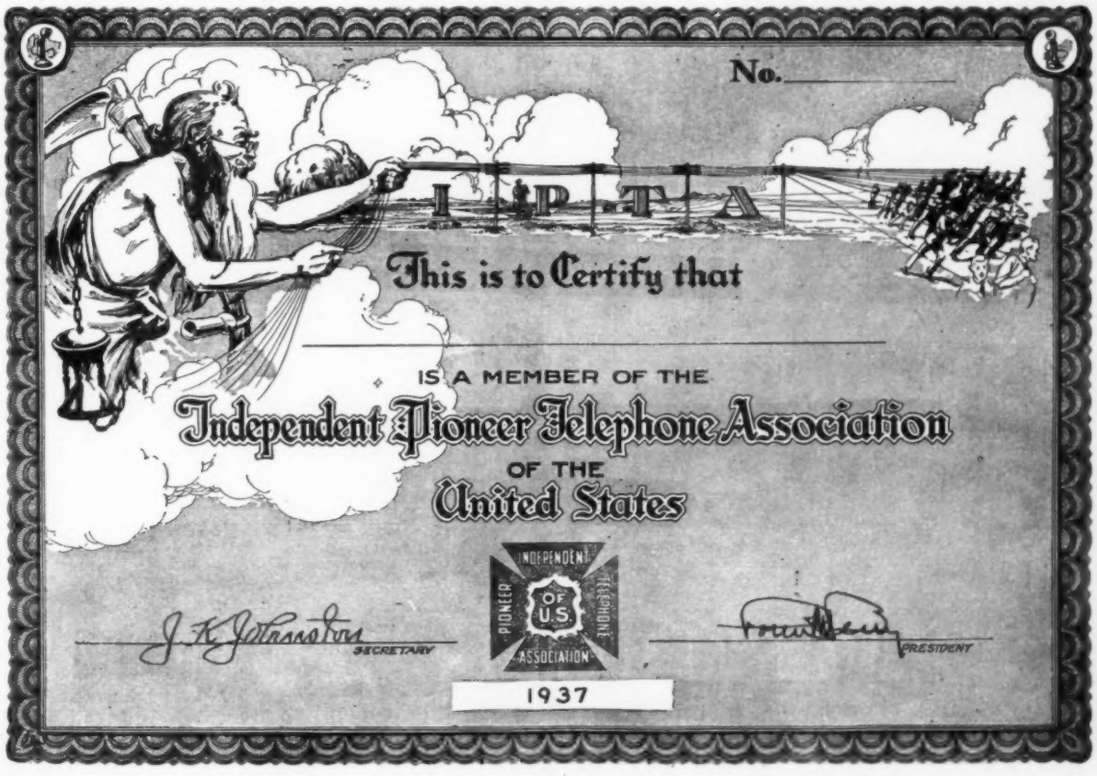

This attractive membership certificate should be framed and hung in your office.

Good-bye to the Wooden Indian ! !

Act II of

Showmanship in Business

by

ZENN KAUFMAN

The words Inquiry, Action, Sale! and the accompanying photographs are illuminated from the rear. They flash in rotation.

● The Wooden Indian is dead. We can remember when he was the deluxe in window display—when no self-respecting cigar store would be without him. But he's gone. Gone with bustles, buggies and Bernhardt.

Tableaux are gone, too. A gentle art—but unable to keep up with the pace of a nation that was headed for double-feature talking and dawn to dusk hops from Washington, D. C., to Seattle, Washington.

Tableaux and Wooden Indians — they've disappeared not because they didn't move fast enough, but because they didn't move at all. One a symbol of popular entertainment—the other an early introduction to what we now call window display.

● The Wooden Indian was built by America's first commercial showman. His name escapes the records—but he probably was an ancestor of George Wellbaum—who so ably carries on the tradition in the windows of the New York Telephone Company. Our education in history was neglected—our estimate of the actual number of living Indians is pretty sketchy—but we'd bet a good cigar that the number of Indians at a peak never equaled the number of people who see Wellbaum's windows in a week.

The secret? Motion!

A simple and effective example is shown in illustration number 1. It's a regular Boy Meets Girl story told in a few pictures, a few words and with the aid of a few lights. The first picture obviously shows the hero getting

a letter which inquires about his product. The word INQUIRY flashes on with all the spirited animation of a spotlight.

● Act two, (wherein Boy Goes for Girl) shows the hero at the telephone telling the prospect all about it. ("I love you," he whispers in her ear, backed up by the genius of Alexander Graham Bell.) The word ACTION lights up to spotlight the hero and Act two comes to an end. Curbstone audiences quiver in a brief moment of suspense while the Third Act curtain goes up to show the telephone back on the desk and the "I got the order" smile on our hero's face. "SALE" says the flasher.

Boy Gets Girl. Next Week — East Lynne. Don't miss it!

Another of Wellbaum's timely displays ties in with the Vanderbilt Cup Races at the Roosevelt Raceway on Columbus Day. It shows a cut-out of a racing official waving the colorful checkered flag. The display is headed: "The Winner" and then the copy goes on to say: "Who will win the Vanderbilt Cup this year? Etc. . . . Who wins sales cups? The man who covers the most territory in the last time, of course! Etc. . . ."On either side of the main banner are photographs of the racing stars with texts describing typical racing flags and historic flags used at the Indianapolis track. George Wellbaum never forgets that he was born a Hoosier.

● Another effective display uses a horse race scene for its center of interest. The horses bob up and down realistically. "Thrill! The thunder of hooves on a fast track. Thrill! The voice of your wife . . . your parents . . . or just a friend . . . over the telephone when you are far away."

Stop! A traffic signal flashes red and a woman alongside of it appears to be worried about some out-of-town friend or relative. Go! says the green, and on the other side of the light she smiles as the text tells here: "Go to her or him by telephone. Lowest rates every night after seven and all day Sunday."

"Get the answer *quickly* by telephone" is the caption on one display and underneath it various questions bob up as the electric switch lights one after another. "Why hasn't he written? Did he get the job? How is mother? When will she arrive? Is Dad better?"

● Of course, no story on motion would be complete without some reference to the most important kind of motion—which is the motion of the prospect toward buying. In the selling of directory advertising, for example, it is important to give a prospect more than

THE Classified Telephone Directory
Yellow Pages lists dealers in nearly everything with addresses and telephone numbers
PUT YOUR FINGER
on the STORE THAT SELLS IT

The book is made of glass. A light behind the hand flashes intermittently.

conversation. Statutes make dull salesmen. Move-gesture-pace the floor—carry things to show, use a little pad and pencil—keep moving. Action begets reaction. Salesmen might be compared inversely to hypnotists whose slow and passive motion puts prospects to sleep. Conversely, the seller must inspire action—in the way of a sale.

It is safe to say that the best thing that could be done with the "Do it now!" signs pasted on thousands of walls would be to take them off the walls and put them on the counters of thousands of telephone offices or place the same three words in the last sentence in every advertisement for telephone service or directory advertising.

● Action! Action! Action! The hat check girl in a night club gets it by leaving a quarter on the plate and the church gets it by passing around a plate. Rather than some vague suggestion of a donation to be put in a box in the vestibule, religion passes the hat every Sunday in order to give man's soul enough financial support to pave his way to heaven with something more than good intentions.

Good-bye to the Wooden Indian. Let's get going!

Refund Battle Postponed

Hearings in the four-cornered court fight being waged by the city, county, state and the Illinois Bell Telephone Company for 1,600,000 unclaimed telephone refunds were continued indefinitely July 1, by Federal Judge Evan A. Evans.

Analysis of the unclaimed portion of the $20,000,000 rate refund, which was made public by the telephone company, revealed that 40 per cent of those who have failed to collect their share owe the company bills that would offset their claims.

Another Long For Louisiana

Lieutenant-Governor Earl K. Long of Louisiana has accepted appointment as consultant in the gas, electric and telephone rate investigations of the Louisiana Public Service Commission, the commission announced in a statement issued recently.

Lieutenant-Governor Long will thus occupy a position similar to that which his brother, the late Senator Huey P. Long, held with the commission.

FREE—Send a self-addressed stamped envelope for your copy of The Showmanship Yardstick—a 12-notch check list of showmanship elements. Do it now — it's worth your while!

Local Test Desk Operation

By C. F. CURTISS

PART II

In this installment the author defines and discusses units of measurement, electromagnetism and Ohm's law.

● In the study of the test desk operation, knowledge of the electrical units of measurement are essential in order that a proper diagnosis of a reported telephone circuit trouble may be made. Three principal units are used, namely the volt, the ampere, and the ohm.

Whenever electricity is produced an electromotive force (E. M. F.) or pressure is set up. This pressure, like water pressure tends to cause an electric current to flow through whatever conductor may be provided. The unit called the volt is used to measure electrical pressure, the ampere is the measure of the current value when it flows along a conductor, and the opposition which any substance offers to the passage of an electric current is measured in ohms.

Attention should now be given to one of the most important generalizations in electricity known as Ohm's law, which may be stated as follows: The electric current in amperes is equal to the E. M. F. in volts divided by the resistance in ohms. In practice the amperes are denoted by the letter ""I, the volts by the letter "E," and the ohms by "R."

●In ohm's law the mathematical expression of the law is $I=E/R$, which signifies that the electric current in any system, such as for example, the test desk battery and its conducting circuit is directly proportional to the E. M. F., and inversely proportional to the resistance. Other forms in which the above equation may be written are: $E=I\times R$ and $R=E/I$. The watt is another factor to be considered and represents the power expended in a circuit when one ampere is caused to flow by a pressure of one volt and equals $W=E\ I$. To find watts when "E" and "R" are known, $W=E^2/R$, and when "I" and "R" are known, $W=I^2\ R$, and $I=W/E$.

In order to bring out some very important principles in the study of local testing. consideration will be given to a fundamental circuit, namely a series circuit illustrated in figure I. As the name implies, the circuit consists of several individual pieces of apparatus connected so that the electric current flows through each part. The total resistance offered to the flow of current through the units designated R_1 ,R_2, and R_3 which comprise the circuit is the sum of their separate resistances including that of the connecting wires and battery. On A circuit diagram, the Greek letter omega (ω) is used as a symbol for ohms, as 5w, 10w, and etc.

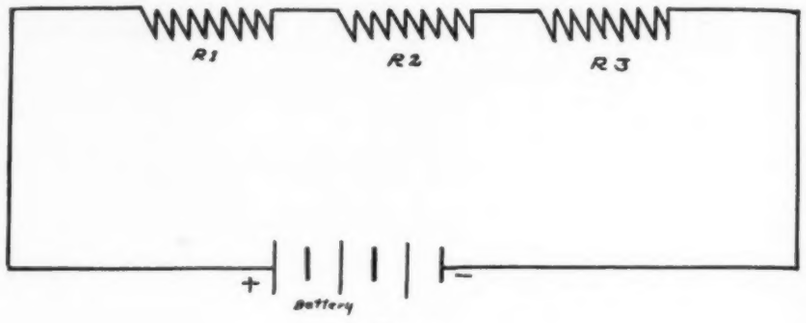

Fig. I

If there are two or more conductors forming a circuit between two points, they are said to be in parallel. Figure 2 represents a parallel circuit. One path or resistance in a parallel circuit is frequently referred to as being a shunt path or a shunt to the other, for example, R_1 may be said to be shunting R_2.

●Examples illustrating uses of the above formulas: (1) How many subscribers have the telephone receiver removed from the hook when the power supplied by the central office battery is 0.35 electrical horse power, the E. M. F. 24 volts, and the current required by each telephone equals 0.040 amperes?

Solution: One horse power equals 746 watts. $746\times0.35=260.55$ watts. $I=W/E$ or $24/260.55=10.85$ amperes. Number of receivers off the hooks equals $N=I_1/I_2$ or $10.85/.040=271$ receivers.

(2) The resistance of a telephone circuit is such that a current of 0.080 amperes is produced at a pressure of 48 volts. If this resistance is reduced by 300 ohms, what current will be produced by a 24 volt battery? Solution: $R=E/I$ or $48/.080=600$ ohms. $I=E/R$ or $24/300=.080$ amperes produced by the 24 volt battery.

A general formula used to find the value of two resistances joined in parallel is J. R.$=\frac{R_1\ R_2}{R_1+R_2}$ or stated in words, the value of a single resistance equivalent to two resistances in parallel, is equal to their product divided by their sum. Example: What is the joint resistance

(Please turn to Page 26)

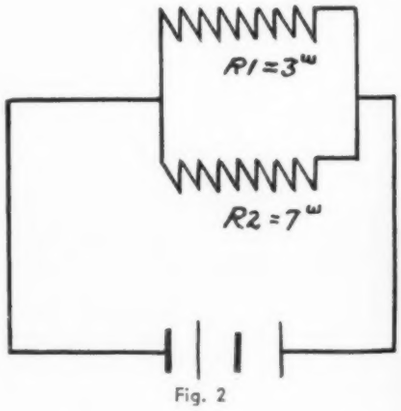

Fig. 2

BECAUSE IT GETS RESULTS!

It's no secret that Automatic Electric C-A-X is the most widely used small automatic exchange equipment in the world today. Over 600 of these full-automatic, unattended units are daily providing their respective communities with the finest type of swift, modern service.

The reason for this overwhelming preference? Simply that the C-A-X gets results wherever it is used. These telephone companies have tried out C-A-X operation under every possible condition of climate and traffic. They know from experience that it gives better service and is more economical. The actual working records of the hundreds of C-A-X's in daily use furnish the testimony for this statement.

Remember, it pays to play safe and buy equipment on facts — on actual case records of hundreds of profitable installations and years of completely dependable operation. That's why we say — Install Automatic Electric C-A-X — and be sure!

Write today for literature describing C-A-X equipment. Or, better yet, send us full information about your small exchange, and we will show you, in actual figures, just what savings C-A-X operation can effect for you!

All Automatic Electric C-A-X units—whether of the switch or relay type—are supplied in neat, all metal, dust-proof cabinets similar to the one shown above.

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Export Distributors: AUTOMATIC ELECTRIC SALES CO., LTD., Chicago

Local Test Desk Operation

(Continued from Page 22)

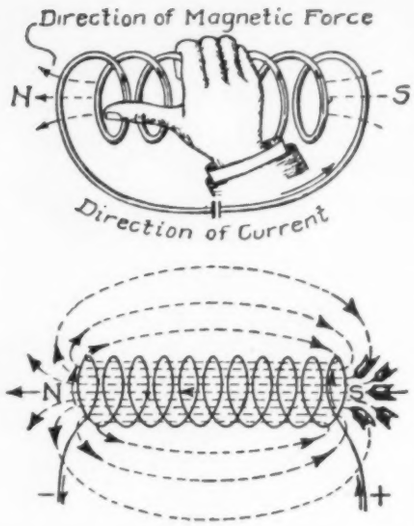
of the two units shown in figure 2? Solution: J. R.$=\frac{R_1 R_2}{R_1+R_2}$ or$\frac{3\times7}{3+7}$ $=2.1$ ohms.

Another way of obtaining the resistance of conductors connected in parallel is by means of the conductance method. The conductance of a circuit is the reciprocal of its resistance. In the above problem the joint conductance equals 1/3+1/7 o. $\frac{7+3}{21}=\frac{21}{10}$ M H O and is the unit of conductance, therefore, the J. R.$=21/10=2.1$ ohms. Find the joint conductance and resistance of three conductors of 2, 4, and 8 ohms respectively? Joint conductors equals ½+¼+⅛, reduced to a common denominator ½=4/8, ¼=2/8, and ⅛=⅛ or$\frac{4+2+1}{8}$ $=\frac{7}{8}$ M H O, or joint conductance. The joint resistance equals J. R.$=8/7=1.142$ ohms.

A very important characteristic of an electric current is its relation to magnetism. Although electricity and magnetism possess entirely different natures in so far as generally known, either may be produced by means of the other. If, for instance, a current of electricity is caused to flow through the turns of a helical coil of copper wire, thus forming an electromagnet with an air core, the result is a flow of magnetic lines of force through the helix in a similar manner as in the case of a permanent magnet. Such a helical coil of wire is known as a solenoid.

When a current of electricity is passed through the winding of a solenoid, it becomes magnetized, as stated above, and the magnetic lines of force pass through its interior from the south to the north pole and return outside from the north to the south pole. The current sets up a force which drives the magnetic lines of force, called magnetic flux, through the path which they take, called the magnetic circuit, just as the E. M. F. in the electrical circuit causes the electricity to flow.

●The magnetic lines of force due to the passage of the electric current through the solenoid is called the magnetomotive force (M. M. F.). If for instance, a string is wound around a top, and the top set spinning, what is it that controls the force of the spin? It is quite evident that the strength with which the string is pulled, and also the number of turns



of the string around the top through which the pull is applied governs the force of the spin.

Similarly the M. M. F. of a solenoid is directly proportional to the product of the number of turns of insulated copper wire in the solenoid and the value of the current in amperes, and turns are carrying.

If "N" represents the number of turns of wire in the solenoid and "I" the current in amperes flowing through the windings, the M. M. F. will vary directly as "N I" that is, the total number of turns multiplied by the current in amperes, gives the magnetizing force in ampere turns.

The same M. M. F. is obtained with a current of 400 amperes through one turn, 20 amperes through 20 turns, or one ampere through 400 turns. In each of these cases the M. M. F. is 400 ampere turns.

●The facility to the passage through it of magnetic lines of force offered by any substance is called permeability. Permeability corresponds roughly to conductivity and may be defined as the relative magnetic conductivity of the substance forming the circuit and that of a vacuum which is taken as unity. There is, however, one important difference between permeability and electrical conductivity, the latter in the case of any particular conductor does not vary (as long as the temperature remains constant), whereas the permeability varies with the magnetizing force. The permeability of non magnetic substance such as copper, wood, glass, air etc. is taken as one or unity. If therefore a piece of soft iron or annealed steel, called a core whose permeability may be as much as 3,000 times that of air, be placed in a solenoid the number of magnetic lines of force will be greatly increased and the iron or steel strongly magnetized, that is, the soft iron or annealed steel offers an easier path for the magnetic lines of force and may be regarded as lessening the resistance of the magnetic circuit, and causing a corresponding increase in the magnetism. Soft iron or annealed steel is used for the core to prevent it from becoming permanently magnetized.

●This arrangement of inserting a magnetic substance in the magnetic circuit of a solenoid converts it into what is called an electromagnet.

The fundamental theory of electro magnetism is as follows: The unit for magnetic lines of force is the maxwell and one line or maxwell per square centimeter of cross section is called a gauss. The total number of lines threading a magnetic circuit is known as the magnetic flux and is represented by the symbol Ø (Greek letter phi), whereas the number of lines passing through a square centimeter or magnetic material is called the flux density or "B."

The strength or intensity of the magnetic lines of force in a magnetic field is called the field intensity, or magnetizing force and is denoted by the symbol "H." Permeability is designated by the symbol "U" (Greek letter mu) and is the term used to indicate the ratio of flux density (B) to the field intensity or magnetizing force (H), or written in the form of an equation

$$U=\frac{B}{H}$$

●The strength of the flux in a magnetic circuit depends upon the reluctance (R) of the magnetic conductor and the magnetic pressure (M). The relation between flux, reluctance, and magnetic pressure or magnetomotive force is $Ø=\frac{M}{R}$, and is sometimes referred to as Ohm's law of the magnetic circuit in which the magnetomotive force (M. M. F.) corresponds to E. M. F., the flux or number of magnetic lines of force to the electric current, and the reluctance to electrical resistance.

The Front Cover

Who can name these Pioneers? The first ten correct lists of names received will be awarded a year's subscription to TELEPHONE ENGINEER free!

Here is a tip! If you are a member of the Independent Pioneer Telephone Association it should be comparatively easy to win—but not too easy. If you are not a member, read how to join as we are carrying an invitation in another section of this issue.

The unit in which reluctance is measured is called the oerstead, and is equal to the reluctance of a cubic centimeter of air. The unit for M. M. F. used in magnetic calculations is the gilbert. Thus, the M. M. F. in a magnetic circuit linked with "N" turns of wire carrying a current of "I" amperes is $4\pi/10$, that is $12.5664/10=1.26$ gilberts.

For practical computation of the required number of turns for producing a certain magnetic flux in a magnetic circuit, the equation $\varnothing=\frac{M}{R}$ is rarely used. Instead the flux density "B" is computed from the equation $B=\frac{\varnothing}{A}$, in which "A" is the cross sectional area in square centimeters. The value of the magnetizing forces "H" for the particular kind of iron used is then obtained from magnetization tables or curves covering the magnetic material used by telephone equipment manufacturers in the construction of electromagnetic apparatus.

● The number of ampere turns to produce this value of "H" obtained from a table is then computed from the equation $N\ I=\frac{H\ l}{1.26}$, where "N I" is the ampere turns, "H" the magnetizing force for one centimeter length and "l" the length of the path in centimeters. Where the magnetizing force "H" is given in ampere turns per centimeter, it is, of course, merely necessary to multiply the ampere turns by the length "l" of the path in centimeters.

It is interesting to note that when the electric current flowing through the winding of an electromaget ceases, a certain amount of magnetic flux is retained by the iron core. The flux retained by the iron is called remanence or residual magnetism. The flux density "B" is therefore, said to lag behind the magnetizing force "H." This relation between "B" and "H" is called hysteresis, and is defined as the apparent molecular friction due to magnetic change of stress, that is, a retardization of the magnetizing or demagnetizing effects as regards the causes which produces them.

The relation existing between magnetism and mechanical pull, in the case of an electromagnet, to the poles of which a piece of iron is to be attracted is very simple. The formula for this relation gives the pull in dynes as follows: $P=\frac{B^2\ A}{8\pi}$, in which "P" equals pull in dynes.

● By dynes is meant the force which in one second can impart a velocity of one centimeter per second to a mass of one gramme. "B" equals magnetic lines of

YOUR

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EXIDE-CHLORIDE BATTERIES

Reliability is the outstanding characteristic of Exide - Chloride Telephone Batteries. They assure dependable power when you want it. During normal operation they will help you to maintain your standards of quick, high quality service *at all times*. More important, however, is the fact that Exide Batteries will deliver the power necessary to carry your exchange through emergency situations.

Accidents, storms, fires, floods and other unavoidable events have a way of upsetting the smooth operation of your equipment. That is when the real value of Exide Battery dependability will make itself apparent. The operation of Exide Batteries is not interfered with by fluctuation or interruptions of the a.c. power supply. Records show that even though submerged in 20 feet of water in flooded exchanges, Exide Batteries have continued to deliver power for the operation of emergency circuits.

You can be sure of this dependable operation, under the most severe kind of emergency or peak load conditions, when an Exide Telephone Battery is installed in your exchange.

Naturally, the value of such performance cannot be measured in dollars and cents; but the economy which results from the many extra years of service which Exide Batteries assure is a factor that can be figured. No matter what your telephone battery job may be, common battery, emergency reserve, signalling, P.B.X.—it will be done more dependably and economically with an Exide-Chloride Telephone Battery. Whenever utmost of dependability, long-life and freedom from care are determining factors, the Exide-Chloride type of telephone battery is invariably used.

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THE ELECTRIC STORAGE BATTERY CO., Philadelphia

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force per square centimeter. "A" equals area in square centimeters. π (pi) equals 3.1416. For example: Suppose a density of 10,000 magnetic lines of force per square centimeter to be produced in an electromagnet by the magnetizing force. What would be the pull in dynes if the poles of the electromagnet had a total area of 100 square centimeters of pole surface? The calculation will show the following: $P = \frac{B^2A}{8\pi}$ or

$$\frac{10000 \times 10000 \times 100}{8 \times 3.1416} = 398000000 \text{ dynes.}$$

● The magnetic lines of force in an electromagnet always flows in a direction that bears a certain relation to the direction in which the electric current is flowing in the winding and to the direction in which the coil is wound. It is possible to determine a north and a south magnetic pole of an electromagnet as well as the relation of the polarity to the direction of the current flow. This relation is expressed in a form of what is called the Right Hand Rule. In this case if the coil is grasped with the right hand so that the fingers point in the direction of the electric current flow through the coil then the thumb will point in the direction of the magnetic lines of force.

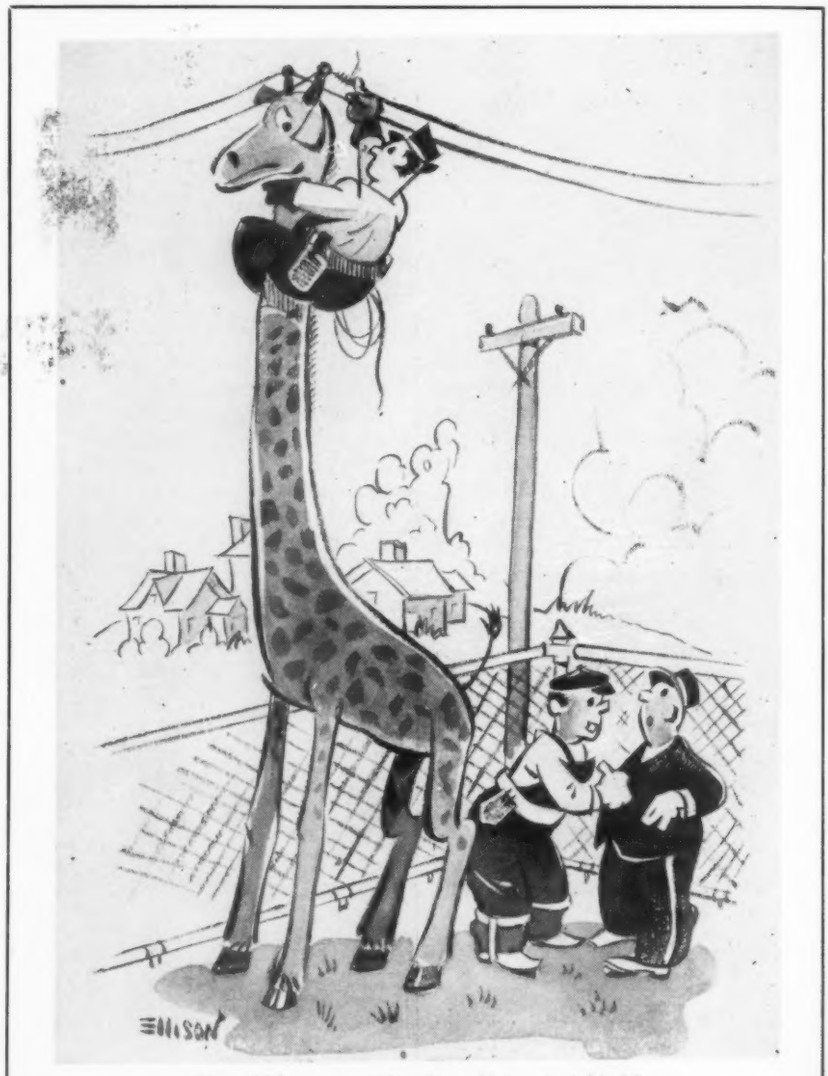
(To Be Continued)

Indiana Pioneer Passes On

Charles M. Martz, 70, prominent in telephone and financial activities and an Indiana Christian Church leader, was buried following funeral services at Tipton, Ind., June 27.

Mr. Martz was vice president and a director of the Farmers Loan and Trust Co., Tipton Furniture Co. director, Goldsmith Bank president and director, and sole owner of the Arcadia Telephone Co.

He was a director of the Bethany Assembly, religious retreat conducted by the Disciples of Christ Church at Brooklyn, Ind., and was for many years its director.



"You will have to pardon Joe. He's nearsighted."

A GRIP FOR ALL NEEDS

No. 1628-5 B.
"Chicago" Grip.
Maximum opening .563.
Minimum opening .115.
Safe Load, 8,000 lbs.

Here's the new "Chicago" Grip capable of handling messenger or guy strand from 3/16 in. diameter up to 1/2 in. diameter. A genuine all purpose grip that can also be used satisfactorily on bare conductors, solid or stranded, from No. 6 to No. 4/0 seven strand copper and A.C.-S.R. up to No. 3/0. A grip that even satisfactorily handles the new three-strand "copperweld" conductor. The bronze-lined jaws prevent slippage. This new grip will afford a sure hold under all conditions, with loads up to 8,000 lbs.

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Foreign Distributor: International Standard Electric Corp., New York

The four pamphlets listed below will be sent without charge to anyone interested. Check the ones you want:

- ☐ Safety for the Pole Climber.
- ☐ Specifications on Linemen's Belts and Safety Straps.
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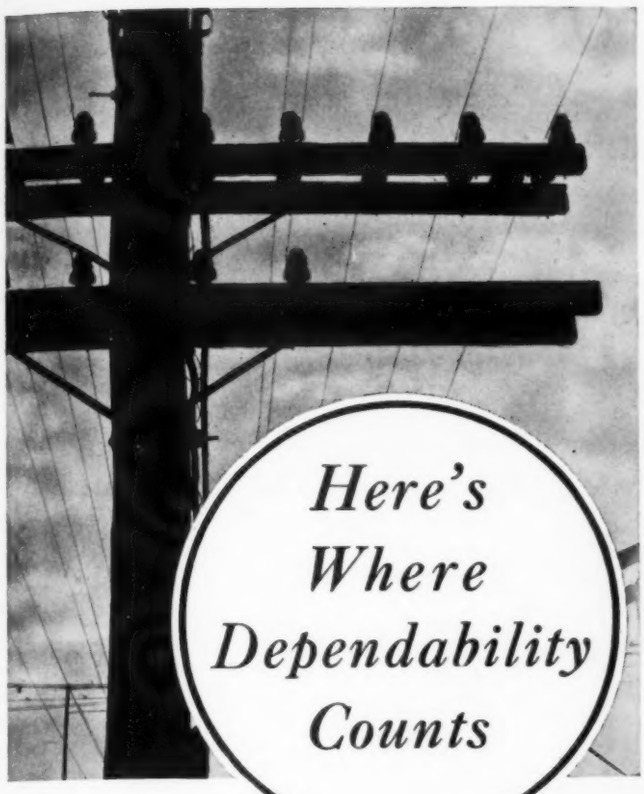

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THE dependability and long life of Perfected Telephone, Telegraph Wires and Strand are no small factors in the excellent operation of the nation's communication systems.

The long life of these wires is further increased by our hot galvanizing process, a tried and tested method wherein the properly treated wire is passed through a molten bath of pure, high grade zinc. Both metals are chemically bonded, to form as strong a combination as when hydrogen is combined with oxygen to form water.

The zinc coating applied by this hot process will not flake, crack or disintegrate under the hardest of service conditions. The coating fully satisfies every service and laboratory requirement for ductility, strength and corrosion resistance.

Because of these facts, millions of miles of Perfected Telephone, Telegraph Wires and Strand are now in service—and coil after coil is specified today with every confidence of long life.

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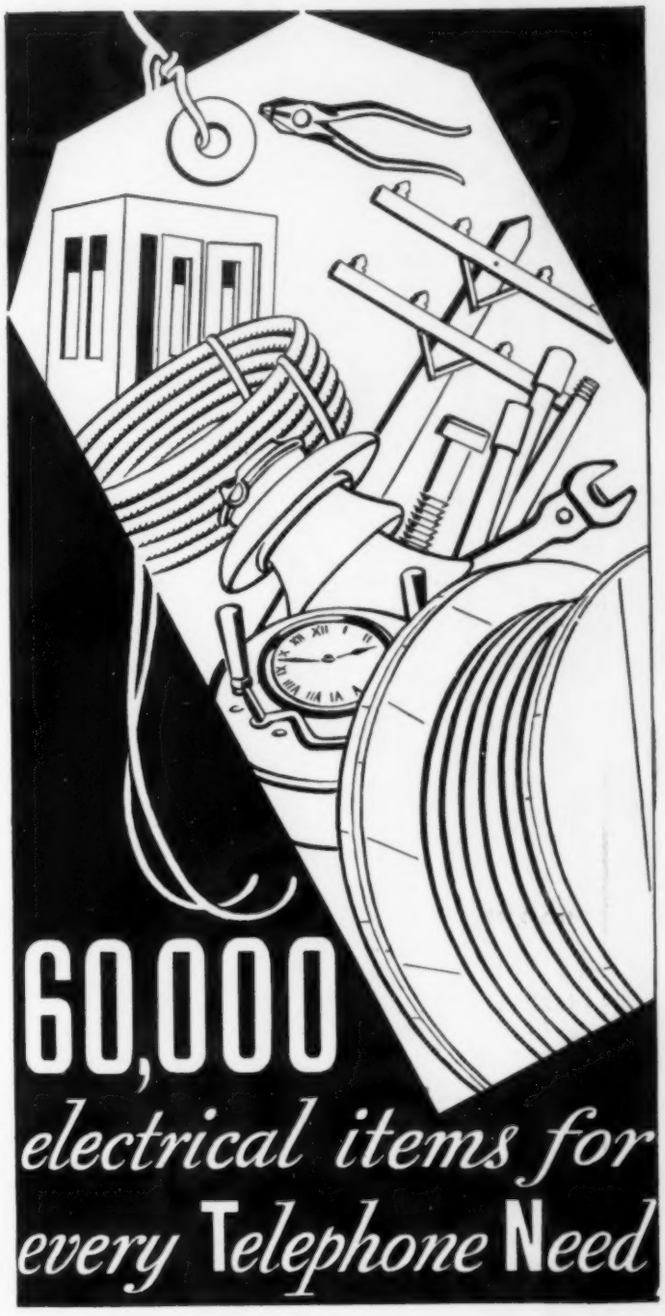
208 S. LaSalle St., Chicago — Empire State Bldg., New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Products Co., New York, *Export Distributors*

UNITED STATES STEEL



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In these days when everyone is looking for purchasing economies, Graybar's service of supplies makes economies possible . . . It brings 60,000 electrical items within arm's reach of the telephone user. Does away with "shopping" around. Eliminates expensive stocks ... The natural result of Graybar's long experience in meeting the special needs of the telephone industry—an experience that goes back to the beginnings of that industry in America. **GraybaR**

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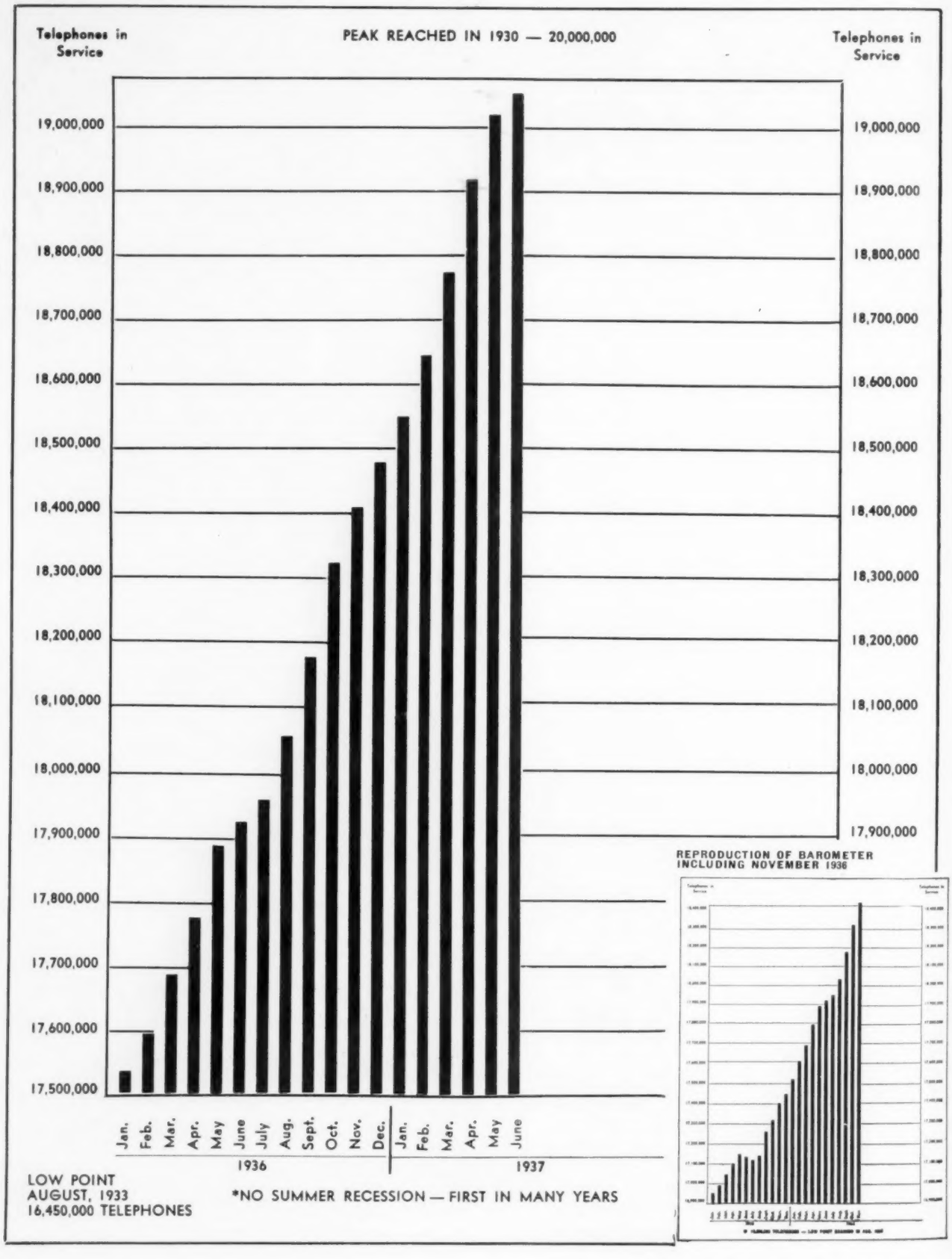
Monthly Telephone Station Barometer



REPRODUCTION OF BAROMETER INCLUDING NOVEMBER 1936

"Tapping In" On Washington

(Continued from Page 16)

operations in comparison with leading Independent telephone manufacturers and with failing to keep up with the progress of telephone equipment development of the Independent companies, were relied upon as outstanding phases of the future FCC report to Congress. More drastic regulation over the depreciation accounting of the Bell System and over the development policies and program of the telephone industry were foreseen as likely to be requested in legislative recommendations by the FCC to Congress. Another point, which the Commission may stress in its Investigation stewardship accounting to Congress, may be legislation pointing towards expanded regulation of Western Electric's activities or towards forcing buying of telephone apparatus and equipment by the Bell System on the "open market."

● The climactic statement by the A. T. & T. special counsel George F. Hurd in the final hour of the Investigation hearings, stressing that the exparte procedure of the sessions had beclouded the value of the inquiry, came after Chairman Walker had announced the opportunity for the filing of corrections on facts and statistics for the telephone companies. Chairman Walker defended the procedure adopted in the Investigation hearings as having been patterned on the lines used by Congressional investigating committees. The FCC Commissioner stated that Congress itself could have conducted the Telephone Investigation and thus the Commission was perfectly justified in using the same procedure as would have adopted by a Congressional body. The investigation hearings involved no administrative order nor any determination of property rights, Chairman Walker pointed out, so it was not a proceeding with "parties litigant" represented by counsel "with the inherent right to cross-examine witnesses and to call witnesses inrebuttal."

A. T. & T. counsel Hurd declared that "frankly we do not think we have had a square deal." He cited the U. S. Supreme Court decision in the Ohio Bell case as illustrating that the FCC had not followed the rules of conduct of a quasi-judicial body which it should have applied in the Investigation proceedings. "Particularly is that true," Mr. Hurd stated, "in view of the fact that the Commission's Investigation staff have pronounced judgments upon many phases and features of the Bell System's structure and operation which have been accepted by the Commission and which have been distributed to State Commis-

(Please turn to page 35)

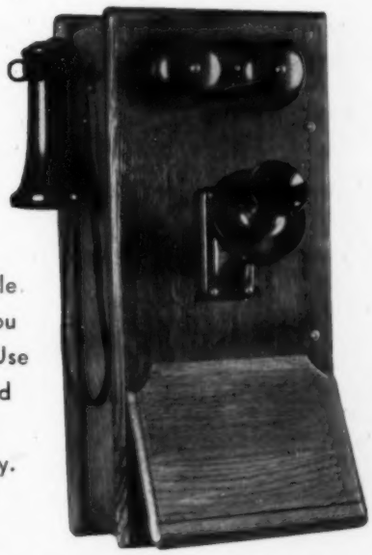
It's Easy to Say---

"It Can't Be Done!"

That's just what many telephone men think when we tell them we can build a fine quality, highly efficient magneto telephone, out of used parts or out-of-service equipment they already have on hand.

Perhaps you have felt that way about it. On the other hand, have you ever tried Suttle Remanufacturing Service to prove it?

We say it can be done, and that you will save anywheres from 25% to 60%. If you need magneto telephones, and have old parts, check up in our Suttle Salesman Catalog or write us about it.



Let Suttle Show You How to Use Your Old Parts Profitably.

It Has Been Done for Many Hundreds of Telephone Companies.

See Our Catalog or Write for Details

Suttle Equipment Co.

Lawrenceville, Illinois

LINE and DESK

RAY BLAIN, Member A. I. E. E., Editor

Q. What is the longest handle that can be obtained in straight shank shovels to be used for pole hole digging?

A. The longest we have ever seen is 12 ft. It seems doubtful whether a shovel with a handle longer than this could be used to advantage.

Q. How may a telephone relay be made slow acting?

A. This is generally accomplished by placing a heavy copper sleeve on the core or a heavy copper slug at one end. The copper sleeve or slug may be regarded as an additional winding of one turn.

Q. When a pole is equipped with a guard arm should a drop wire be deadened on the pole or at the end of the guard arm?

A. Ordinarily the drop wire should be deadened near one end of the guard arm as this provides unobstructed climbing space.

Q. What is the so-called drawbar and how is it used in telephone work?

A. This is a clamping arrangement which can be attached to the end of a pole. When a long pole is placed on a pole trailer the drawbar may be attached to the end and used to hitch onto the pintle of the construction truck.

Q. How does the outside diameter of 24 ga. cable compare with 22 ga.?

A. As an example a present day 100 pair 22 ga. cable has an outside diameter of about 1" and 150 pair 24 ga. cable has practically the same diameter.

Q. Is the hanging type handset considered satisfactory for mounting on a desk?

A. We consider it entirely satisfactory for anyone who prefers this type of instrument. It has the advantage that it does not utilize any space on top of the desk, and always being in the same place may be located quickly at all times. Neither is the receiver ever caught on trays or books to prevent the switch hook from breaking contact.

Q. How did the transmission unit "Decibel" get its name?

A. The "Bel" is a unit of loss in power or attenuation and is so named in honor of Alexander Graham Bell, inventor of the telephone. This unit is larger than could be conveniently used for practical purposes so a unit one tenth as large called "Decibel" has been generally adopted for telephone and radio use.

Q. Is there any attachment which can be used with an ordinary wood bit to permit the drilling of holes to an even and specified depth for use on such work as installing pole steps?

A. Yes; there is an inexpensive gauge which may be clamped on a bit and permits holes to be bored to an even depth. This gauge can ordinarily be obtained at any up-to-date hardware store.

Q. How hot should paraffin be heated for use in boiling out cable?

A. It is quite important that paraffin be heated to between 375 and 390° F. If overheated paraffin is lifted in a dipper a few inches and poured back into the pot it may ignite. When this occurs it may be smothered out by covering with a tight fitting lid or canvas. Suitable instruments should always be available to accurately determine the temperature of paraffin.

Q. Is it considered a satisfactory practice to splice 19 and 22 ga. paper insulated cable together?

A. No; it would not ordinarily be considered good telephone practice to splice these two sizes of cable together. Neither would it be possible to make a good twist splice in these two sizes of wire for the smaller 24 ga. would simply wrap around the 19 ga. wire and not twist up with it like wires of equal size. If these two different sizes of cable must be spliced together then we would suggest the soldering of all joints.

Q. We have considerable clay conduit with the ends chipped slightly which we hate to discard. Can you advise a method whereby it may be used to advantage.

A. If the chipped places do not extend over two inches back from the edge the pieces can generally be used if the break is placed at the top. The hole for the lower dowel pin should be in firm conduit wall as this is necessary to keep the bottom of the duct level and in line for sliding duct rods. The broken part at the top should be covered with a piece of sheet metal or rubberoid roofing before plastering over with cement. Usually scraps of suitable metal can be purchased at a reasonable cost from a sheet metal shop.

Q. We are considering the stringing of some 1200 pair cable aerial. Do you consider this feasible and if so should we use a double messenger strand?

A. We would not consider placing 1200 pair cable in the air under any consideration. We would not use larger than 400 pair aerial and we would hesitate on even that in view of the low maintenance cost and long life of underground construction. The 1200 pair cable is designed and constructed for underground use and we do not believe the sheath would be heavy enough for aerial use. Should you use this cable we predict your trouble will be excessive within a very short period of time.

Q. What is the resistance of the average common battery transmitter and what is the maximum current that they will stand?

A. That is a most difficult question to answer for numerous types of transmitters are now manufactured to meet various service requirements. Most companies now zone their transmitters. One company manufactures a short zone transmitter, having an average resistance of about 30 ohms for use on subscribers' lines up to 250 ohms and will handle a current up to 280 milliamperes without burning. At 280 millamperes its talking resistance would be about 22 ohms. The long loop transmitter designed for use on lines of over 250 ohms is designed to be more efficient on lower current values and its average talking resistance is about 75 ohms. The safe current limit for this transmitter is usually considered at about 120 milliamperes.

Telephone Barometer Goes Over Top

With the steady increase of telephone installations throughout the country the barometer featured on page 30 of this issue presents an interesting problem.

It shows no summer recession for the past two years as was common in years prior to 1936. Revising the chart on the first of January with 19,100,000 top, we expected this would serve until the Fall. However, it now looks as if the former high peak of 1930 will be surpassed in the coming months.

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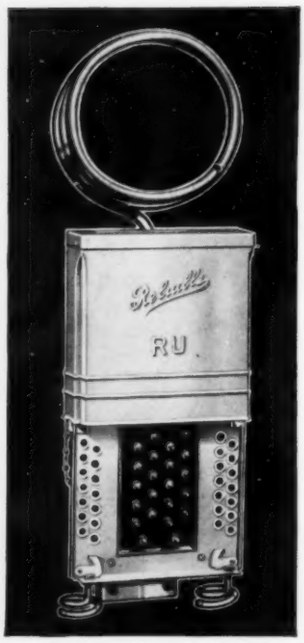

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Location of Cable Faults

(Continued from page 18)

is then readily determined by substituting the settings of the several arms in one of the formulas previously given.

The location of shorts, grounds, or crosses with the Wheatstone Bridge requires a special type of bridge connection and measuring procedure. This type of bridge measurement is referred to as a "loop method." The name results from the method employed in "looping" a good and faulty wire together and connecting them to the X arm of the bridge and at the same time *feeding battery current for bridge operation into the bad wire through the fault itself.*

● The one and only advantage of the loop method is the fact that the resistance of the fault does not affect the accuracy of the measurement. Straight resistance measurements are of little value in locating faults except where the fault itself has practically zero resistance.

Two Principal Loop Methods There are two principal loop methods used by telephone companies in locating open wire and cable faults, these are known as the *Murray* and *Varley* loops. The two methods are equally good as far as accuracy is concerned, however, the Varley method is the more popular. This article describes only the Varley method.

Faults which occur on cable or open wire are of four general types, viz:

1. Grounds, 2. Shorts, 3. Crosses, 4. Opens.

We are concerned in this bulletin in the use of the bridge for locating any one of the first three classes of trouble. The location of open faults is not as practical as the location of the other types of faults and will not be discussed herein.

● There are two Varley Loop methods in general use which are known respectively as the "Simple Varley," and the "Three Varley" method. The simple Varley is useful only *where the good and bad wires have approximately the same resistance,* and where a high degree of accuracy is not required. In general, it is useful in locating moisture trouble, due to sheath breaks in aerial cable where a good wire is available in the same cable.

Instructions for the Simple Varley Method The following procedure should be followed when making fault locations with the Simple Varley loop method. (See figure 4.)

Step 1. Select a bad conductor (in case of wet cable) having the heaviest leak to ground, also a good conductor having an insulation resistance of at least 300,000 ohms to other wires and to ground. This good conductor should be the mate of the bad conductor if possible, or at least a conductor in the same cable.

Step 2. Send a man out to the first cable terminal past the section in which the fault is known or thought to exist and identify the good and bad wires and strap together with a short copper wire.

Step 3. Connect the good wire to the X_1 post on the bridge, and the bad wire to X^2. Set the A/B ratio arm to 1.0 and adjust the rheostat (R) arm so that the bridge is balanced, as shown by zero deflection of the galvanometer. The *resistance of the bad wire from strap to fault* is then determined by the following equation:

$$X = \frac{R}{2}$$

Where—
X=Resistance from strap back to the fault in ohms.
R=Rheostat setting in ohms.

That is, divide the rheostat setting in ohms by two to obtain the resistance of the bad wire from strap to fault.

Step 4. The distance in feet from strap to fault can be obtained by multiplying the resistance from strap to fault by the feet per ohm for the gauge cable involved. The following table gives feet per ohm and ohms per 1000 feet for 19, 22, and 24 gauge cable at 68° F.

Cable Gauge	Ft. Per Ohm Per Conductor	Ohms Per 1000 Ft.
24	38.96	25.67
22	61.95	16.14
19	124.20	8.05

Another method of obtaining the distance from strap to fault consists in measuring the total resistance of the bad wire and dividing this into the overall length in feet to obtain the feet per ohm. This latter method is somewhat more accurate than using the average "feet per ohm" values, providing the exact length of the cable is known. The computation is as follows:

$$\text{Feet Per Ohm} = \frac{l}{Rb}$$

Where—
Rb=Total resistance in ohms of bad wire.
l=Total length in feet of bad wire.

The resistance of the bad wire is obtained by measuring the loop resistance of the good and bad wire and dividing by two.

The following example (See Fig. 4) shows how a location is made by the Simple Varley method on a 24 gauge cable.

With the good and bad wires strapped together the bridge balances with R set on 20 ohms. The resistance from strap

to fault is therefore—

$$X = \frac{R}{2} = \frac{20}{2} = 10 \text{ ohms.}$$

The distance from strap to fault in feet is therefore equal to

$$10 \times 38.96 = 389.6 \text{ feet.}$$

(TO BE CONTINUED)

"Tapping In" On Washington

(Continued from page 31)

sions and otherwise, far and wide."

In opening his statement, Mr. Hurd cited Chairman Walker's exposition of the Investigation procedure and stated that "of course this is not and has not been an adversary proceeding as that term is ordinarily understood, but I would like to go back to the Congressional Resolution and point out that the Resolution went further than merely to order an investigation of the American Company and its Associated Companies and other companies with respect to the subject matters specified in the resolution; it directed the character and quality, or rather specified the character and quality of the information to be obtained, namely as accurate and comprehensive information.

● "Now, there is really only one sort of proceeding experience has fully demonstrated that, in which that kind of information can be obtained, and that is a proceeding in which there is at least reasonable opportunity for cross-examination of witnesses by those under investigation and some opportunity for those under investigation to offer testimony through their own witnesses who also may be subject to cross-examination.

"It seems to us that by the Resolution, Public Resolution Number 8, Congress by necessary implication charged the Commission with the duty of selecting procedures and methods by which the type and quality of information specified by Congress, would be obtained and not some other kind of information.

"We have desired, as the Company said from the start, to assist the Commission in every possible way, but insofar as the hearings are concerned, up to now an opportunity has been denied us to assist in the procuring of accurate and comprehensive information by means and methods which experience has demonstrated is the only way to get it.

"It seems to us that the end which Congress directed, that is, the procuring and compiling of accurate and comprehensive information, could not be reached, could never be reached by the method which has been followed, that the Commission was charged by Con-

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gress with selecting methods and procedures which would reach that end, and we think that such methods and procedures were open and ready.

● "Certainly, this is true, that if the Commission had at the outset, when it first began to gather its facts, sought the co-operation which the company would be glad to render in the obtaining of those facts an enormous amount of labor would have been saved. I am confident that the great bulk of the facts could have been stipulated and in that manner removed from the field of doubt or controversy, and all the time required for the presentation of those facts through testimony could have been saved.

"If, likewise, the Commission staff had candidly discussed with us the opinions which they had formed, the inferences which they had drawn, the conclusions which they had reached, I am sure that as to many of them an agreement would have been reached very quickly, others would have been corrected, others would have been abandoned, and the number of controversial points would have been greatly reduced."

"If a co-operative method, a reasonable co-operative method had been followed from the start, we would have had ample opportunity for the presentation of any remaining controversial matters and for examination and cross-examination on them, and we would have arrived at a record which would be truly helpful to the Commission in the discharge of its duty under the Congressional resolution, that is, the procuring and compiling of accurate and comprehensive information.

● "As it is, we have a record which is full of misstatements and replete with unwarranted and unfair criticism of the Bell System. It is not and cannot be made an instrument of assistance in the procuring or the compiling of accurate and comprehensive information. It leads away from that result and not toward it."

In answer to the assertion about the failure to give a "square deal," Chairman Walker declared that the public in state commission proceedings which had been long drawn-out had not had a square deal. This declaration led Mr. Hurd to say that such a view indicated a prejudiced attitude by the Division Chairman of the Investigation results, but Commissioner Walker replied that there had not been any prejudgment but "there had been the introduction of certain facts" in the probe. Commissioner Walker also rejected the idea of Mr. Hurd that cross-examination should have been permitted by citing that if cross-examination had been allowed the Investigation would have lasted for four years. The A. T. & T. counsel countered with the view that a method of co-operation between the telephone company and the Investigation staff could have eliminated many stipulated facts and the cross-examination would have been held down to the controverted points.

● Mr. Hurd confronted the FCC with a citation of the Securities Act, one of the major New Deal statutes, which prohibits misleading facts from registration statements of security issues, and showed that the Investigation reports had omitted proper facts about the telephone industry as well as only selecting a few facts to bear out their conclusions. The A. T. & T., it was disclosed in the exchange between Chairman Walker and Mr. Hurd, had called upon the Investigation staff for the working data and papers on which were based the Western Electric cost studies and comparisons of costs and prices with Independents. Investigation counsel Baldridge promised to turn over all work data possible to the company, but it was ruled that cost figures obtained from Independent manufacturing companies could not be given to the A. T. & T.

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Independents' Apparatus Far Ahead of Bell System . . .

● Describing a number of examples of advances in telephone apparatus progress by leading Independent telephone manufacturing companies, another important Investigation report by Chief Engineer Hill drove home a charge that the complete interlocking of the A. T. & T., Western Electric and Bell System companies had eliminated "all competition" with an alleged result that Bell System equipment was often more costly and less efficient to operate and maintain than similar apparatus produced by Independents. The Investigation Chief Engineer emphasized that the Bell System companies should be free to buy the best available equipment whether from Western Electric or from Independent manufacturing companies. If this policy had been carried out, he claimed that telephone rates would be much lower today.

● Products of the Kellogg Switchboard & Supply Co., Automatic Electric Co. and Stromberg-Carlson Telephone Manufacturing Co. in manual switchboards, handset telephones and other apparatus were cited by the Investigation report as having been developed and marketed years before similar equipment was produced by Western Electric. A major phase of this condemnation of Bell System policy took to task the adoption of panel dial equipment as having been too costly and not so efficient as the step-by-step system of the Automatic Electric. In many significant types of telephone apparatus, it was alleged the Western Electric had been tardy in following up new developments in the telephone art and had not been willing to accept the inventions of other companies but had delayed its production until it could perfect its own devices.

The FCC Investigation charged that this policy had definitely resulted in a higher-priced telephone plant on which the subscribers paid for through increased rates. Further, the policy was induced by the desire of the A. T. & T. to make intercompany profits through the profits of Western Electric Co. in order to fulfill an objective of "10 per cent earnings in A. T. & T. stock."

● Another series of Investigation reports introduced in the final hearings were intended to depict a picture of Western Electric's costs of manufacture being 20 per cent higher on major types of telephone apparatus than costs shown by leading Independent manufacturing companies. The Western Electric costs also were held to be higher by 25 per cent than the maximum costs, which the FCC Investigation staff felt should be allowed to the operations of the Bell System manufacturing company.

Bell System Depreciation Comes Under Severe Fire . . .

● The Bell System's depreciation accounting methods, which were alleged to have led to excessive reserves, came in for severe castigation by Investigation Chief Engineer Hill in one of the closing Investigation hearings, while theories in regard to depreciation, expounded by Independent telephone leaders, notably E. C. Blomeyer, vice president of the Telephone Bond and Share Co., were cited as exemplifying better treatment of this major item of telephone operating expense.

The Bell System was charged with failing to comply with the accounting requirements of the former Interstate Commerce Commission and the present FCC Uniform Accounting Systems in its depreciation accounting and it was alleged that the Bell System methods had built up excessive reserves, part of which had been reinvested in telephone plant. As a result the telephone subscribers contributed to the fixed capital investment on which the rate base was founded. Another failure to comply with the Uniform System of Accounts was charged against the Bell System in its refusal to deduct the entire depreciation reserves in determining a rate base valuation. The Bell System's depreciation reserve at the end of 1936 was placed at $1,000,250,000 or 26.5 per cent of the total property value of the telephone plant

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"Tapping In" On Washington

(Continued from page 37)

which amounted to $4,259,000,000.

● Another line of attack was directed at the claim that the Bell System had had almost complete discretion over its depreciation accruals, unhampered by regulation. When the Interstate Commerce Commission adopted its depreciation accounting order after lengthy proceedings before ICC Commissioner Eastman, the FCC Investigation staff charged that the Bell System was able to win over the ICC to adopt completely the depreciation methods and views of the telephone industry. In adopting the Bell System theories, the FCC Investigation pointed out that the railroads, power companies and state commissions opposed the straight-line accrued depreciation method of the A. T. & T.—among the power companies opposing the telephone depreciation methods were the Insull companies.

FCC Rules Jamestown Exchange Not Bell Controlled

On July 7 the Federal Communications Commission ruled that the Jamestown (N. Y.) Telephone Corporation is a common carrier as contemplated by section 2 (b) (2) of the Communication Act of 1934, and as such is subject only to sections 201-205 inclusive of the act, effective on execution. Their finding that the local (Jamestown) interests have at all times effectively controlled the company irrespective of the large interest owned by the New York Telephone Company, was not unexpected by the industry due to previous hearing before the FCC.

Informed of this decision while passing through Chicago from an extended motor trip through the Southwest and West Coast, Mr. John H. Wright, president of the Jamestown company with whom he has been associated for the past 34 years, stated that the ruling was expected and was to his entire satisfaction. His efforts to have this ruling, and subsequent success by the action of the FCC, closes a case that has been before the commission for many months.

Bell Station Gain Tops '36

The Bell system in June had a net gain of 31,400 stations, against a gain of 25,600 in June last year and 95,000 in May, 1937.

Smaller gains shown in June this year and a year ago reflect seasonal trends, as with the start of the vacation season disconnections of residence telephones are substantial.

For the six months to June 30 the station gain for the Bell system was 527,000 telephones, against 378,300 in the like 1936 period.

Phone Toll Service to Alaska

The American Telephone and Telegraph Company filed, July 7, tolls with the Federal Communications Commission disclosing the establishment of a regular toll service to Alaska. Juneau alone will be served for a time. The rate between Juneau and Seattle for three minutes will be $9 in the daytime and $6 on nights and Sundays.

$300,000.00 Construction Program

A $300,000 construction program is being carried out this year by the Interstate Telephone company. (Wash.)

The company is now operating 44 telephone exchanges, serving 20,870 telephones. The number of phones served has increased from 16,500 since 1933.

Appeal Planned On St. Paul Rates

The Tri-State Telephone and Telegraph Company has taken steps to appeal to the state Supreme Court from the decision of Ramsey county District Court ordering blanket telephone rate reductions of 25 per cent for the St. Paul metropolitan area.

LEGAL NOTICE

LON J. DARLEY, Complainant,
vs.
ALABAMA PUBLIC UTILITIES COMPANY, A CORPORATION, Respondent.

IN THE CIRCUIT COURT OF MONTGOMERY COUNTY, ALABAMA, IN EQUITY

Pursuant to an order of the Circuit Court of Montgomery County, Alabama, In Equity, entered in the above entitled cause on the 21st day of May, 1937, notice is hereby given that all prospective purchasers of the telephone properties located in Pickens, Marion, Lamar, Winston and Franklin Counties, in the State of Alabama, and of all other properties in the custody and possession of the Receiver of the assets of Alabama Public Utilities Company, a corporation, are invited to file their sealed bids with the Register of this Court on or before noon of June 21, 1937, for the purchase of said properties, subject to the perfection of title in these proceedings, or by such other method or proceeding as may be advisable, and to the approval of such title by the prospective purchaser's attorneys.

The Court reserves the right to reject any or all bids, and to require such evidence of good faith and ability to perform the contract of purchase and of ability to secure the approval of the Alabama Public Service Commission to such purchase, and to perform the needed public service in the operation of said properties, as to this Court may appear reasonable and proper.

This the 24th day of May, 1937.
GEO. H. JONES, JR.

Register of the Circuit Court of Montgomery County, Alabama, In Equity

By decree rendered in the above stated cause by the Circuit Court of Montgomery County, Alabama, In Equity, on June 21, 1937, the time for filing sealed bids with the Register of said Court, as referred to in above notice is extended, and said bids may be filed on or before noon of August 23, 1937; and any such bids may be accompanied by any reasonable conditions as to the bidders may seem fit, the Court reserving the right to reject any and all bids.

This the 22nd day of June, 1937.
GEO. O. JONES, JR.

Register of the Circuit Court of Montgomery County, Alabama, In Equity

Describes Japanese Telephone Service

The July 18 issue of the Chicago Tribune carried a story that will be of interest to telephone men all over the world. We liked it and with their permission are reproducing it herewith:

"One of the best examples of the mess a business undertaking can be thrown into through government operation is the telephone system in Japan. When the telephone service was inaugurated in 1890 the government decided to run it as a monopoly, and the way it has done so is a pain in the neck to the public.

"Suppose you want a telephone and send in an application to the ministry of communications. First you are required to attach $3 with the application. Now let us see what happens. You wait and wait and wait. A month passes and no telephone. Two months, three months, six months, a year, and still no telephone.

"If at the end of a year your telephone is installed it is a miracle. If you get your 'phone after two years you still can regard yourself extraordinarily fortunate. Some people have waited more than five years for their instrument and some still are waiting.

"There are at present 282,221 persons who have sent in applications and are waiting for their phones. If 10 per cent of these persons get their phones before next summer it will be a miracle.

"The excess of demand over supply has put a high premium on telephones. It costs anywhere from $200 to $300 to buy a "privilege of installation" from an owner. This is the only way one can have a telephone installed quickly at present.

"After that the buyer must pay for the wire and sometimes for the telephone poles needed to connect his home with the main line. In some cases this amounts to more than $100. It takes at least a fortnight, usually much longer, before an instrument is installed.

"In contrast with the poor local service is the fast and efficient international radiotelephone service. It is faster to phone to Chicago from Tokio than from Tokio to Osaka, a distance of 300 miles. The voice is usually clearer on a trans-Pacific call than in a city connection.

"Perhaps the reason is that the tran-Pacific radiotelephone service is run by a private concern, the International Radiotelephone company, Ltd., which was established in 1932 with a capital of $3,-000,000. Only when the government interferes, as during the army revolt last year, is the service faulty.

"The Japanese are extremely superstitious regarding telephone numbers. There are lucky numbers and unlucky ones and the difference in price of a lucky number and an unlucky one is sometimes double. This, of course, is when a telephone is bought from a broker or direct from an owner.

"The Japanese try to avoid all numbers with 42 in it. This is because 42 is pronounced the same as "to die." It is difficult to sell the number 4242, "to die, to die," except to an undertaker. Even an undertaker, however, will hesitate to purchase, 3742, "every one will die."

"On the other hand there is a great demand for 4919, "everything will go well." One of the popular theaters in Tokio paid a high price for 3730 and 3734, "to see the whole show." A vegetable shop paid a premium for 808, vegetable store."

Doctor Loses Rate Suit

A suit for $190 against the New York Telephone Company, based on the claim of Dr. Henry Eichacker, of Ridgewood, Queens, that he was charged at a commercial rate whereas he was entitled to a residential rate, was dismissed June 25, by Justice Crawford in Municipal Court.

The Court held that since the physician contracted for the commercial rate he had no legal cause of action. The case, of interest to many physicians who maintain offices at home, will be appealed, it was said.

I. T. & T. To Build Soviet Line

The soviet government has placed a contract with a subsidiary of International Telephone and Telegraph corporation, calling for establishment of telephonic links between Moscow and Russia's further frontiers, it was announced today.

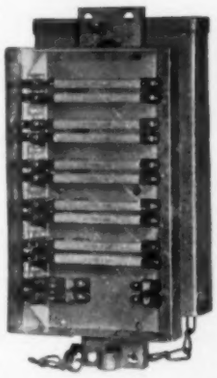
The company said the contract contemplates telephone and telegraph lines from Moscow eastward across Siberia to Khabarowski near the Manchukuoan boundary, a distance of 5,300 miles.

The system will be equipped with specially designed transmission apparatus providing several telephone circuits, telegraph channels, and provision for radio broadcasting and photographic transmission channels.

COOK

For DEPENDABLE TELEPHONE TERMINAL AND PROTECTION EQUIPMENT

Insist on COOK

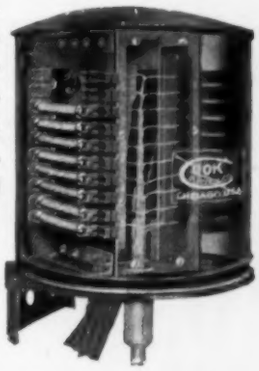


S-X TERMINAL

The Cook S-X is a 4, 5 or 6 pair terminal for spots where you require just a few subscribers' drops.

S-6 TERMINAL

Cook S-6 Terminal provides a perfect means of terminating and distributing cable—and effective protection with a minimum maintenance cost. 11 to 102 pairs. Equipped with Cook True Gap Dischargers that will not permanently ground the line.



COOK ELECTRIC CO.
2700 Southport Ave. Chicago

Always Specify COOK PROTECTION

More Hours of Service

. . . that's what every telephone engineer seeks . . . *more hours of service* . . . which means fewer replacements, lower service costs! And that's exactly what Ray-O-Vac telephone batteries offer!

For 3 decades Ray-O-Vac batteries have met and exceeded specifications and requirements on every recognized telephone and light intermittent test, and surpass all government standards. For lower service costs, specify Ray-O-Vac!

RAY-O-VAC COMPANY
Formerly FRENCH BATTERY COMPANY
MAIN OFFICES AND PLANT
MADISON, WISCONSIN
Additional Factories at Clinton, Massachusetts and Lancaster, Ohio

Wood Preservation Increases 53.4%

The number of poles treated in 1936 was 3,119,248, an increase of 1,085,548 over the number reported in 1935. Over 67 per cent of all poles treated were southern pine, all of which received full-length pressure treatment. The total number of poles of this species that were subjected to treatment in 1936 was 2,102,246. Poles of western red cedar occupied second place with a total of 666,856, all but 12,193 of which received non-pressure (open tank) treatment. Northern white cedar poles ranked third with 199,473. The balance of 150,673 comprised poles of southern red cedar, lodgepole pine, chestnut, Douglas fir, oak, and redwood.

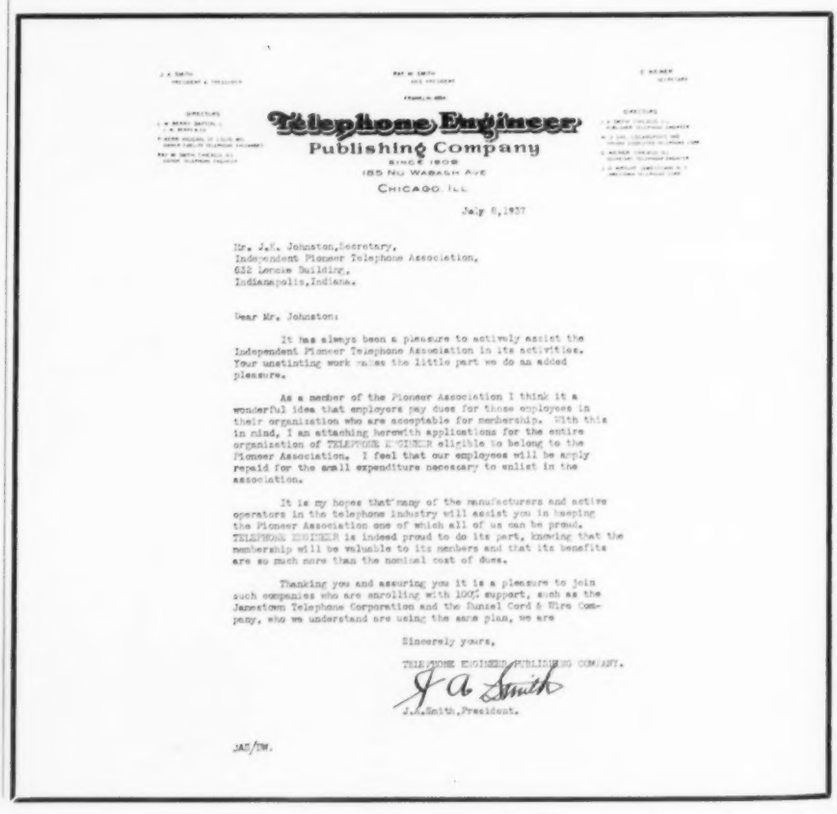
Of the total number of poles subjected to treatment during the year covered by this repart 2,145,066, or nearly 69 per cent, received pressure treatment and 974,182 non-pressure (open-tank) treatment. Of the poles treated 98.3 per cent were treated with creosote.

Butt-treated poles increased by 22½ per cent. Increase in poles treated was 53.4 per cent for 1936 over 1935. Southern pine increased 77.6 over the same period.

The accompanying table shows by kinds of wood and kinds of treatment the number of poles reported in 1936.

POLES TREATED BY KINDS OF WOOD AND KIND OF TREATMENT—

Kind of Wood	Pressure treatment (Number)	Non-pressure treatment (Number)	Total (Number)
Southern pine	2,102,246	.....	2,102,246
Cedar			
Western red	12,193	654,663	666,856
Northern white	.....	199,473	199,473
Southern red	.....	5,823	5,823
Lodgepole pine	1,310	85,485	86,795
Chestnut	.....	26,433	26,433
Douglas fir	22,703	960	23,663
Oak	6,059	.....	6,059
Redwood	59	215	274
Miscellaneous	496	1,130	1,626
Total	2,145,066	974,182	3,119,248



Telephone Engineer
Publishing Company
SINCE 1908
185 NO WABASH AVE
CHICAGO, ILL.

July 8,1937

Mr. J.K. Johnston,Secretary,
Independent Pioneer Telephone Association,
632 Lemcke Building,
Indianapolis,Indiana.

Dear Mr. Johnston:

It has always been a pleasure to actively assist the Independent Pioneer Telephone Association in its activities. Your unstinting work makes the little part we do an added pleasure.

As a member of the Pioneer Association I think it a wonderful idea that employers pay dues for those employees in their organization who are acceptable for membership. With this in mind, I am attaching herewith applications for the entire organization of TELEPHONE ENGINEER eligible to belong to the Pioneer Association. I feel that our employees will be amply repaid for the small expenditure necessary to enlist in the association.

It is my hopes that many of the manufacturers and active operators in the telephone industry will assist you in keeping the Pioneer Association one of which all of us can be proud. TELEPHONE ENGINEER is indeed proud to do its part, knowing that the membership will be valuable to its members and that its benefits are so much more than the nominal cost of dues.

Thanking you and assuring you it is a pleasure to join such companies who are enrolling with 100% support, such as the Jamestown Telephone Corporation and the Dunnel Cord & Wire Company, who we understand are using the same plan, we are

Sincerely yours,

TELEPHONE ENGINEER PUBLISHING COMPANY.

J. A. Smith

J.A.Smith,President.

JAS/DM.

H. M. Stewart to Pennsylvania Association

Announcement of the selection of H. M. Stewart, now secretary of the Texas Telephone Association, Austin, Texas, as successor to the late H. E. Bradley, former head of the Pennsylvania State Telephone & Traffic Association, has just been made by John H. Wright, president of that Association.

H. M. Stewart

Mr. Stewart will assume his new position with the Pennsylvania Association as of September 1st, and with Mrs. Stewart will move their home from Texas to Pennsylvania. His successor to secretary of the Texas Telephone Association will be George Butler Bryan, according to reports which have not been confirmed at this writing.

Well known to the telephone industry through his excellent work in Texas, Stewart was named over a number of applicants for the position. Formerly connected with one of the large telephone companies, and while representing that company in Texas, he was drafted by Oscar Burton, president of the Texas Association, to serve as secretary and has made an enviable record in that position. We feel that the Pennsylvania association will be more than pleased with their selection of Stewart to carry on for their beloved H. E. Bradley, who passed away just a few days prior to their annual convention held in May.

New Stromberg-Carlson Indiana Representative

The appointment of Colby Knapp as Sales Representative for Stromberg-Carlson in the Indiana territory has just been announced by Ben Woodbury, Telephone Sales Manager. He fills the post left vacant by the recent death of Paul Meyers who served the Indiana district during the past seven years.

Mr. Knapp had previously been representing Stromberg-Carlson on telephone sales in Iowa. Prior to that he was responsible for radio contacts in Iowa and northern Illinois. At an earlier date he was located in the Chicago branch where he had much to do in handling Stromberg-Carlson construction material and supplies.

General Telephone Six Month Record

General Telephone Corporation reports for its subsidiaries a gain of 1,401 company-owned telephones for the month of June, 1937, as compared with a gain of 596 telephones for the month of June, 1936. The gain for the first six months of 1937 totals 13,835 telephones, or 4.13 per cent, as compared with a gain of 10,555 telephones, or 3.38 per cent for the corresponding period of 1936. The subsidiaries now have in operation a total of 348,551 company-owned telephones.

Wisconsin Has Union Troubles

The first charter in Wisconsin for a telephone operators' union was initiated at Janesville June 24, Assemblyman Ben Rubin (prog., Milwaukee), an AFL organizer, revealed recently.

At the same time, he said charges have been filed with the national labor relations board against the Wisconsin Telephone Co.

The charges, filed by Edward J. Brown, a vice-president of the International Brotherhood of Electrical Workers, AFL affiliate, allege that the company interfered with employes' entering a union of their choosing and tried to form company unions.

Rubin declared that the telephone operators union has obtained 90 per cent membership in Janesville.

Brown also is a member of the University of Wisconsin board of regents.

WHITNEY BLAKE TELEPHONE WIRE

In the manufacture of its insulation Whitney Blake incorporates anti-oxidents in combination with other ingredients which result in an age resisting, tougher compound, more highly resistant to any compression or strain encountered in service. "LONG LIFE" "WB" wire is the most economical that you can buy.

Illustrated is No. 17—Drop Wire Parallel. Spec. 5791.

Buy Your Wire by the Year, Not by the Foot

THE WHITNEY BLAKE COMPANY
NEW HAVEN, CONNECTICUT

WB

Distributed and guaranteed by
GraybaR ELECTRIC COMPANY

Foreign Distributors: International Standard Electric Corporation, 67 Broad Street, New York City.

Sole Selling Agents in U.S.A.

Independent Pioneers

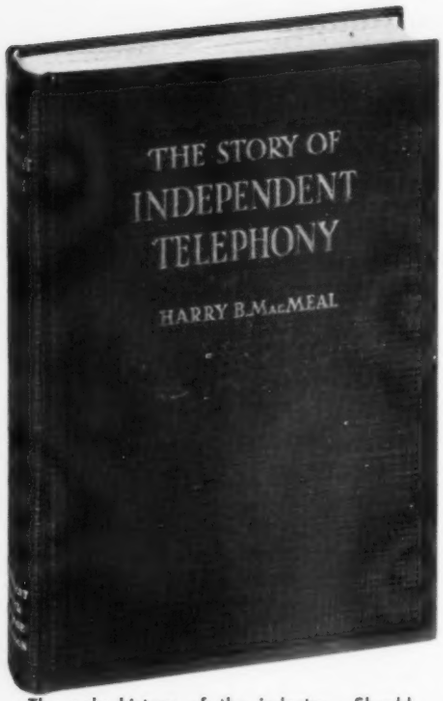
(Continued from page 19)

The objects of this association of Independent telephone men is to perpetuate and preserve the traditions, the sentiment, the ideals of public service, and the spirit of industrial cooperation. We have all been part of a great and necessary industry and the lives of the Pioneers have been full of adventure, romance, and achievement. When we look back to 1893, the year the Bell basic patent expired, and realize there were only 230,000 telephones in service but through the spur of Independent cooperation, a peak of 20,000,000 telephones was reached, we will realize what a tremendous influence the Independents had on giving the Nation its present comprehensive telephone service. It is this remarkable achievement that will give the Independent Pioneers their place in history.

To successfully accomplish any task it is necessary not only that you should obtain for it the best there is in you, but that you should obtain for it the best there is in those under your guidance—this, the Pioneers have always done. The association is the clearing house, meeting place and archives of Independent progress and development.

The Pioneers Association is not unmindful of the loyalty and support represented by its present all-high membership. The benefits of membership are not inconsiderable:

First: There is the bronze and blue badge of honor.



The only history of the industry. Should be in every telephone man's library.

Second: The embossed membership certificate for a conspicuous place on your office wall or for your den.

Third: The $1000 accident insurance policy which you could not buy for twice the cost of your membership.

Fourth: Harry B. MacMeal's splendid history of the industry—a three hundred page $3.00 book, which should be read by every telephone man. Among the four hundred letters of approval, this is from George A. Briggs', formerly president of the Chicago Telephone Supply Company:

"Congratulations. You did a good job and Cuneo tailored it well. I have been busy with it for four hours and what a lot of glamourful ghosts you recalled from the far-flung, misty past of a hardy breed. It is plain to be seen you have been an industrious hombre. As a researcher, I must hand it to you. Then, too, your rhythmic English makes the book easy reading. You were tuned up and you played something. Your story was just as I would wish it told. I am sure all the old-timers will feel the same way. You have the true spirit of 'Charity towards all and malice towards none.'"

Aside from these benefits there is the insertion of your name, years of service, position in the industry, (your picture, too, if you have served thirty years) in the annual yearbook, the national meeting and banquet each year, and many other services. All covered by the nominal annual $3 dues.

Will you take this appeal as being directed especially to you and will you please do your bit by writing J. K. Johnston, Secretary, of Independent Pioneer Telephone Association, Indianapolis, Indiana, for application blank? When you receive these blanks fill them in and join these Pioneer immortals in their work of perpetuating the ideals of Independent Telephony.

JOHN H. WRIGHT, President
LLOYD C. WRIGHT, Vice President
GILBERT H. JACKSON, General Counsel

WAYNE R. STEVENSON, Treasurer
ARNOLD P. HOLMBERG, Secretary
HAROLD C. WHITE, Auditor

JAMESTOWN TELEPHONE CORPORATION
JAMESTOWN, NEW YORK

January Nineth
1 9 3 7

Mr. J. K. Johnston, Secretary
Independent Pioneer Telephone Association
632 Lemcke Building
Indianapolis, Inciana

Dear Mr. Johnston:

I have always believed in giving credit where credit is due and I am therefore writing you this letter with reference to the Pioneer Association.

For some years past our company has made it a practice to pay dues for any employee eligible to join this Association. The gross amount has been small, but I believe that the employee's pride and interest in the work has been increased largely through these memberships. Its value has been called to my attention at various times, particularly when an employee's service record becomes sufficiently long to make them eligible for membership; the transfer of employees from one company to another, at which time they have asked about the continuance of membership; and in one or two cases with reference to payments made under the insurance policy which the membership carries. These are the results I have seen, looking perhaps from a selfish standpoint.

I sincerely believe that even though none of these benefits were to be derived by the company, it would still be worth while for the company to pay for such memberships to help instil or increase the pride of the employee in being a member of the telephone industry.

Very truly yours
Lloyd C. Wright
Lloyd C. Wright
Vice President

LCW:B

W. L. RUNZEL, President and Treasurer
TELEPHONE AVENUE 8100
W. L. RUNZEL, JR., Secretary and Assistant

RUNZEL CORD AND WIRE CO.
MANUFACTURERS OF

CORDS FOR TELEPHONE AND SWITCHBOARDS
LABORATORY AND GALLERY MACHINE CORDS
TINSEL AND COPPER CONDUCTOR CORDS
AND CORDAGE OF ALL TYPES
INSULATED CORDS CABLES AND WIRES
MICROPHONE CORDS AND CABLES
PLAIN TELEPHONE CORDAGE
PLAIN TELEPHONE CORDAGE
RADIO SPEAKER CORDS
TERMINALS

RADIO BAT WING INSULATED AND STRANDED
LITZENDRAHT CORDS AND INSULATIONS
ELEVATOR ANNUNCIATOR CABLES
WIRE—SILK AND COTTON INSULATED
OFFICE ANNUNCIATOR CABLES
FLAME PROOF JUMPER WIRE
RADIO HEAD PHONE CORDS
RADIO HEAD PHONE CORDS
RADIO BATTERY CABLES
PIG TAIL WIRES

4727-31 MONTROSE AVENUE
CHICAGO, U. S. A.

June 29, 1937

Mr. John K. Johnston, Secretary
Independent Pioneer Telephone Association
632 Lemcke Building
Indianapolis, Indiana

My dear Mr. Johnston:

The Jamestown, New York Telephone Corporation has set a splendid example in their 100% support of the Independent Pioneer Telephone Association. Mr. John H. and Mr. Lloyd C. Wright are to be commended for their considerate attitude toward their employees. It is good business and a generous gesture toward an Association we all should support 100%.

You and your officers and directors are doing a constructive work for Independent telephone men and give such real value and service to your members that I feel you should have full co-operation.

I am enclosing check to cover memberships of all officers and employees of the Runzel Cord and Wire Company who are eligible for membership and I sincerely hope the leading operating and manufacturing concerns in the field give you this same support that the Association may represent all the Independent Telephone Pioneers eligible for membership.

Will you please command me for any further assistance I can give you in your good work.

Very sincerely yours,
RUNZEL CORD & WIRE COMPANY
W. L. Runzel
President and Treasurer

WLRunzel:BR
Enclosure

The Home of the Perfect Cord

Economical Scientific Air Control

From time to time we receive inquiries relating to various types of electrical fans and air circulators. One of those asked about frequently is Roto-Beam, the type of air circulator used by telephone companies at Cincinnati, Cleveland and Toledo.

We investigated this circulator and found it to be quite unique. For one thing it is unusually quiet. As the manufacturer claims, Roto-Beam does produce an actual moving beam of air, whirling helically, causing a suction which draws the air from the lower, upper and all intervening sections of the Roto-Beam blade. This beam of air causes circulation of all the air in the room, at all levels.

Roto-Beam air control units available in A. C. and D. C. 3 speed models in 18, 20 and 24 inch sizes: A. C. single speed models also available. "Junior" models 8, 10 and 12 inch A. C. and D. C. in 3 speeds and a 12 inch Le Luxe model. Prices from $17.50 to $145.00. Manufactured by Motor Service & Mfg. Co., 3300 Indiana Avenue, Chicago, Illinois.

New Cord Manufacturer

A new company for the manufacture of telephone and instrument cords has recently been formed in Rochester, New York, under the name of the Commercial Cord Manufacturing Company, address 131 Woodbine Avenue, East Rochester, New York.

Mr. J. Dale Williams who heads the company, has had long experience with telephone manufacturing companies, specializing in cord work. He was with the Western Electric Company for over eight years, and later with the Stromberg-Carlson Telephone Manufacturing Company as a cord engineer in charge of manufacturing for nearly fourteen years. He has written articles for *Telephone Engineer* and other publications at various times.

Mr. Williams has many friends in the telephone business who are predicting a very successful business for his new company.

Sue to Cancel New Directory

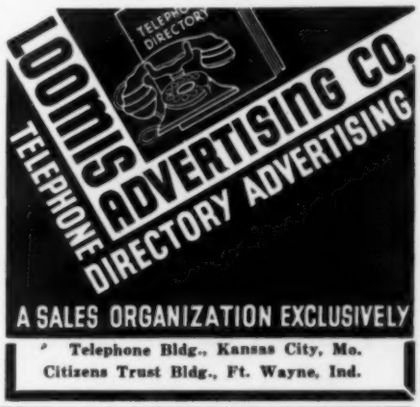
Mr. L. S. Rochelle has entered suit against the Durham (N. C.) Telephone Company to recall its new directory. Mr. Rochelle claims his number listed in that directory is the number of his keenest competitor and that the rival concern gets calls directed to him. His claim to the court also states that he had his number for several years, but the alleged error was in favor of his competitor and ruinous to his business. Disposition by the court has not yet been made.

George K. Heyer Completes His 35th Year With Graybar

On July 1, 1902, a few days after his graduation from Rutgers, where he was awarded letters in baseball, football and track, George K. Heyer started the student course through the shop Installation and Drafting Department of the Western Electric Company. He completed this course in September, 1903, and for the next three years was in the Telephone Engineering Department. From there he spent a year in the Service Conditions Division of the Engineering Department.

In October, 1907, he was put in charge of Telephone Catalog and Railroad Division in the Telephone Sales Department. In 1910 he was made Railway Sales Engineer. In 1913 he was appointed Assistant Telephone Sales Manager. For the year of 1920 he was Power and Light Sales Manager. In 1921 he went back to the Telephone Department as Assistant General Telephone Sales Manager.

In January, 1926, when the Supply Division of the Western Electric Company became the Graybar Electric Company, Mr. Heyer was made General Telephone Sales Manager. In April of that year he became Assistant General Supply Sales Manager and in 1927 he was appointed General Telephone and Power Apparatus Sales Manager—the position which he still holds.



Crapo
GALVANIZED PRODUCTS
Crapo Galvanized Telephone Wire is drawn from iron, and steel, of special analyses . . . . scientifically processed under direct laboratory supervision . . . . extra galvanized by the Crapo Patented Process. Each grade and size is produced in accordance with the most rigid specifications and laboratory-inspected for correct results. This exactitude in manufacture, backed by years of experience and research, insures galvanized line wire which meets every requirement for electrical conductivity, tensile strength, ductility and durability.
Readily available from representative jobbers in the following grades: E. B. B., B. B., Steel and Crapo HTL-85 High-tensile, Low-resistance Line Wire. Consult the nearest distributor, or write direct!
TELEPHONE WIRE
STEEL STRAND
INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

The Clearing House

For the convenience of readers of Telephone Engineer

Accounting Systems

ACCOUNTING

HERDRICH AND BOGGS
Certified Public Accountants
Specializing in Telephone Accounting and Rate Cases Since 1918.
803 ELECTRIC BUILDING
Indianapolis, Indiana

Your Bookkeeper

Should be one who has had the practical experience of Operating, Owning and Managing Telephone Plants. He should be a specialist in Telephone Accounting. He should be able to make up the books in his office from data supplied by you, and at a nominal cost.

He should supply the necessary reporting Forms without charge, and be ready to assist you with your various annual Government or State reports. Twenty-five years of this kind of experience is offered to you.

Francis A. Bowdle
Registered Public Accountant
BOX 642, WHEATON, ILL.

ACCOUNTING, TAX & RATE CONSULTANT

22 years continuous contact with telephone organizations.

C. B. RUSSELL
Interurban Building
COLUMBUS, OHIO

Repeaters

A NEW TELEPHONE REPEATER

Harding Universal Telephone Repeater Self-adjusting to changing lines. Cord-circuit, Terminal and Line adaptations. No external balancing equipment. By-pass and Intermediate Ringer. Selective or Dial Switching control. Working at 15 DB in dispatching circuits; 20 DB in toll circuits.

HARDING TELEPHONE REPEATERS
2138 N. New Jersey St., Indpls., Ind.

For economical, dependable and safe anchoring use Mastergrips. Ask your jobber or write to The Aiken Mastergrip Anchor Co., Inc., 114 North Seventh Street, Saint Louis, Missouri.

Signaphone Makes Pathe News

The newly perfected Signaphone manufactured for the Signaphone Corporation of America, had their device demonstrated in Pathe News to movie goers all over the world.

Mr. W. F. Colton, Sales Manager, has demonstrated his device to a number of civic organizations throughout the country and the Pathe News presentation was a very interesting climax.

The pictured story showed a sketch of Signaphone Invisible Ray protection in a residence where a child was sleeping in a second floor bedroom. As the parents leave the house, guarded only by the Signaphone Invisible Ray and Signaphone, a kidnapper is shown driving up to the house in an automobile and watching from behind a tree until the parents are out of sight. He then climbs a ladder to the second floor, enters the bedroom, takes the child from the crib and goes back down the ladder. The Invisible Ray is interrupted by his entrance and automatically starts the Signaphone, which is shown operating. The call is taken at the police station, who sends out a radio call to cruiser cars who arrive at the scene and block the kidnapper's car before it can be started, to arrest the kidnapper and rescue the child. The entire action takes about five minutes.

The Peninsular Telephone Company in Florida are cooperating with the company and are actually providing protection to residences and business houses in that section. Demonstrations have been made in Tampa, St. Petersburg and a number of other cities. Suitable for burglar alarm, hold-up alarm and sprinkler alarm, we understand the company is meeting an excellent reception with many contracts for installation of Signaphone.

Appoint Hopkins to N. Y. Sales Manager

General Cable Corporation announces the appointment of Mr. R. S. Hopkins as Manager of the New York Sales Office, 205 East 42nd Street.

Mr. Boberg Dies

Charles Boberg, for many years Credit Manager of Stromberg-Carlson's Chicago office, passed away at his home Thursday, June 24th. His successor has not been named.

Poles

Carney
CEDAR POLES
Plain or Butt Treated
B. J. CARNEY & CO.
100 No. 7th St. Minneapolis

Finished Cedar Poles
VALENTINE CLARK CORPORATION
St. Paul, Minn.

Telephone Directories

Telephone Directory
ADVERTISING
Write or telephone for proposition
L.M.BERRY & CO.
Call L.D.16 - Telephone Bldg., Dayton, O.

Telephone Engineers

J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies
105 West Adams Street
CHICAGO

J. W. WOPAT
CONSULTING ENGINEER
Telephone Engineering — Construction Supervision — Appraisals — Financial — Rate Investigations
303 East Berry Street
Fort Wayne, Indiana

JOHN C. LARKIN AND COMPANY
● CONSULTING
ACCOUNTANTS AND ENGINEERS
Specializing in a Professional Service to Telephone Utilities Covering the Field of Accounting and Engineering
Chamber of Commerce Building
SYRACUSE, NEW YORK

The Clearing House

For the convenience of readers of Telephone Engineer

SPECIALISTS IN
Rebuilding and Repairing
TRANSMITTERS
Absolutely finest workmanship guaranteed
Baked, black, velvet finish, New granular carbon. Workmanship, adjustments and tests made with the latest and most improved apparatus. 50c each less backs. One year money back guarantee.
Full information on request
SWITCHBOARDS
Rebuilt Magneto Switchboards, 50 line, 100 line, 150 line. Quotations on request.
ALSO —

W. E. grounded transmitters rebuilt into insulated style with floating diaphragm, baked enamel fronts	75c
W. E. grounded desk stands insulated and rebuilt, baked enamel, new cords	$ 3.25
Magneto switchboards, new oak cabinets, rebuilt Kellogg equipment, 50 lines, 7 pairs of cords	200.00
100 lines, 10 pairs of cords	300.00
W. E. No. 1317 rebuilt 5 bar 1600 ohm wallphones	12.00
New bakelite mouth pieces for W. E. transmitters, each 6c, per 100 $5.00, per 1000	30.00
Cook B-7 substation protectors	60c

NEW OAK CABINETS
Inside terminals wired in place and diagram for W.E. of Kell. ringer boxes or wallphones ..... $2.00 to $4.35

Telephone Repair Co.
1760 LUNT AVE., CHICAGO, ILLINOIS
DANIEL H. McNULTY, Manager

RECONSTRUCTED EQUIPMENT

Kellogg No. 301 E 500 ohm line drops and jacks 10 per strip @	$16.00
Kellogg No. 3A 100 ohm line drops and jacks per strip of 5 @	6.25
Western Elec. No. 22C Shutter type line drops and jacks 5 per strip @	8.75
Western Elec. No. 2C Ball type 80 ohm line drops and jacks 5 per strip @	6.00
Kellogg No. 2696 4-bar 1000-1600 or 250¢ ohm Bdg. compact type wall sets	8.00
Western Elec. No. 317 5-bar 1000-1600 or 2500 ohm Bdg. compact wall sets with 47 Gen. and external post line connections @	8.50
Kellogg No. 84 desk set with Kellogg Trans. & Rec. complete with New cabinet 3-bar 1000-1600 or 2500 ohm ringer inside connection signal set $9.50—4-bar $10.00—5-bar @	11.25
Western Elec. No. 20 desk set with W. E. Trans. & Rec. Complete with New cabinet No. 315 3-bar 1000-1600 or 2500 ohm ringer inside connection signal set @ $9.75—4-bar $10.50—5-bar	11.50
Kellogg New Grabaphones with New cabinet inside connection 3-bar 1000-1600 or 2500 ohm signal set @ $12.25—4-bar $12.75—5-bar @	14.00
Kellogg Grabaphone No. 115 Stand & No. 11 Grabaphone complete less signal set @	7.25
Western Elec. No. 21 W 1 M. F. Condensers @	.35
Monarch desk set complete with 3-bar 1000-1600 or 2500 ohm ringer inside connection signal set @	7.85

REBUILT ELECTRIC EQUIPMENT CO.
Not Inc.
1934 W. 21st St., Pilsen Sta.
Chicago, Ill.

New Signal Relay Announced

Jester-Cooper Company, Houston Texas, are offering an A. C. operated relay that will function on alternating or pulsating current over a wide range of frequencies of small current values.

Its usefulness may be extended to practically every branch of the telephone industry but it is particularly adapted to the telephone communication field because the current output of such equipment is usually small. The wide range of frequencies (0 to 10,000 cycles) and low operating current values (200 Micro Amperes or .0002 Amperes) makes a combination that is readily adaptable to every phase of the telephone communication field.

Chance Rock Anchor

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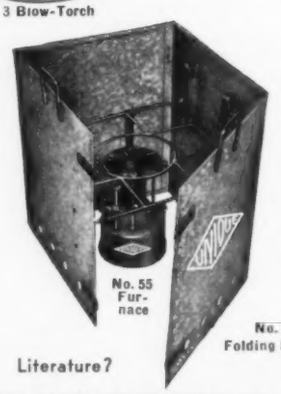

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